AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 8, No. 16. WEEKLY. | NEW YORK, APRIL 18, 1885. | $2.50 per Annum. SINGLE COPIES, 5 CENTS.

COPYRIGHT, 1885, BY AMERICAN MACHINIST PUBLISHING COMPANY.

For Sale Everywhere by Newsdealers.

ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

New 15-Inch Pillar Shaper.

This machine, made by Rochester Machine Tool Works, Rochester, N. Y., is a heavy and powerful tool of its class, and is designed with reference to convenience in handling, and rapid work.

The crank is so arranged that while it gives even motion on the forward stroke, it returns the ram, when on full stroke, 3½ to 1. The slides in which the ram works are 26 inches long, and proportionately wide. The ram is 40 inches long.

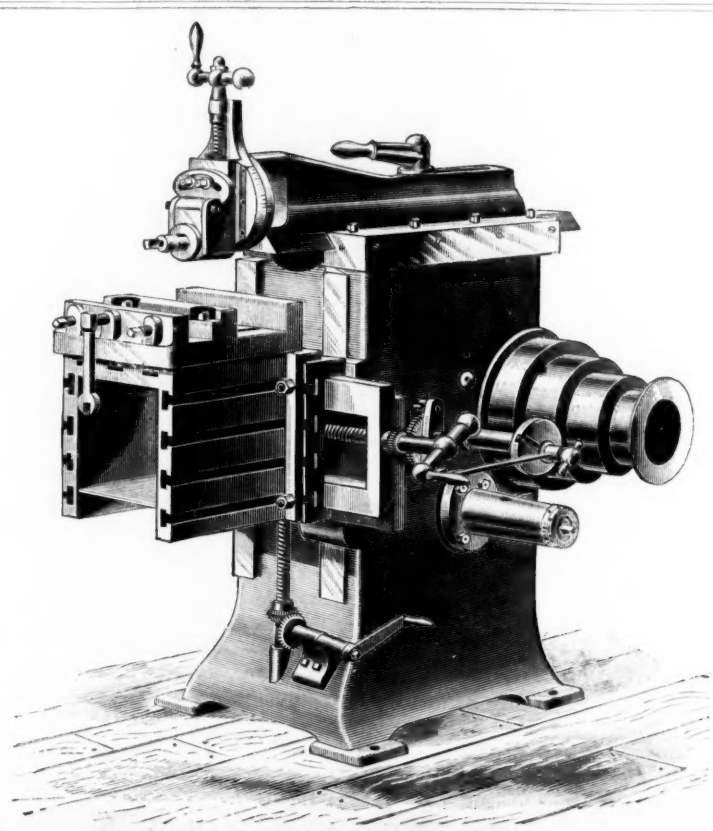
The cone shaft, of steel, is 1⅝ inch diameter, with bearings 15 inches long. The cone has four speeds for 3-inch belt, the largest step being 13 inches diameter.

The bearing of large gear is 12½ inches long, 2¼ inches diameter, and has a shaft through its axis by means of which the position of the crank pin is changed at will, to lengthen or shorten stroke, while the ram is either in motion or at rest. No binding device, or tightening of nuts to secure crank in position is required. The platen is long and rigid; work extending to the floor may be clamped to either side, or it may be removed and the work bolted to the saddle. The platen has a travel of 22 inches on the cross-head and vertical movement of 15 inches. By removing the vise, work 22 inches long, 15 inches wide and 18 inches high may be planed on the platen.

The vise has jaws 12 inches long, faced with cast steel; it opens 8 inches; the sliding jaw is self-adjusting to any taper. The vise swings upon a king post, and fastens securely in any position.

The automatic cross-feed is adjustable from $\frac{1}{72}$ inch to $\frac{3}{16}$ inch, feed always taking place during return stroke.

The tool slide has graduated head for angular feeds, and a down feed of 5 inches. All adjustment of stroke, feed, speed and platen are from the front or working side.



FIFTEEN-INCH PILLAR SHAPER.

The countershaft has a cone, the duplicate of the one on the machine, and fast and loose pulleys 12 inches diameter for 3-inch belt

An improved circular feed is furnished when desired; it can be used without removing the platen, and admits of work being planed either upon the centers or upon a face plate; feeds automatically.

The weight of machine is about 2,400 pounds.

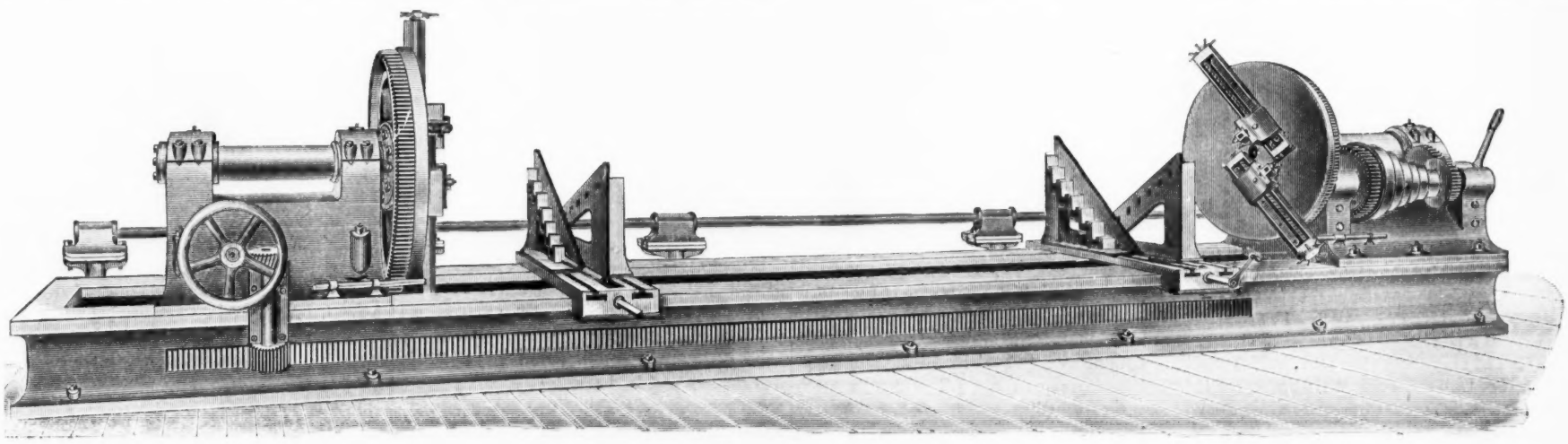
Lathe for Facing Flanges of Columns and Pipe.

The engraving represents a lathe for facing the flanges of a column or pipe at both ends at the same time. The column or pipe to be faced is placed in the V-shaped saddles, which are adjustable to any desired size by means of screws, thus making it easy to place the column on a line with the centers of the lathe, and also makes both ends of the column or pipe absolutely parallel to each other, and at right angles to the center line of column.

One head is easily moved on the bed by means of a hand-wheel and gearing to suit any length of column.

There are two cutter-heads on each face-plate; one carries a roughing tool and the other a smoothing tool, so that each flange is finished with once passing over. These tools feed across the face of the flange at the rate of $\frac{1}{16}$th of an inch at each revolution, and will take a cut one-half inch deep. There is also a longitudinal feed of about two inches for the purpose of turning the edge or periphery of the flange. It will face a circular flange 52 inches diameter, or a flange 36 inches square.

The cut represents a lathe to take in a column up to 20 feet in length. Weight of lathe, 22,000 lbs. Made by S. S. Hepworth & Co., Yonkers, N. Y.



LATHE FOR FACING FLANGES.

Mr. P. McQueen Gibson, master mechanic of the New York Central Railroad shops, Thirtieth Street, New York, recently drew our attention to a sheet which had been taken out of an extended smoke-box, and which was worn thin, as if subjected to long-continued action of a sand blast. The wearing agent in the case was the constant attrition of the cinders passing through the tubes, and being projected downward by the deflector. Mr. Gibson is particularly successful with his front ends, and he certainly ought to be so, for extreme care is exercised in maintaining the smoke-box air-tight. He fits the sheet resting on the cylinder saddle carefully and makes an air-tight joint there, and fortifies the whole by an inside lining of heavy sheet, through which the pipes are fitted accurately. Doing the job in this way entails extra work in the first instance, but it saves in time and expense, with compound interest, when the engine is in service.

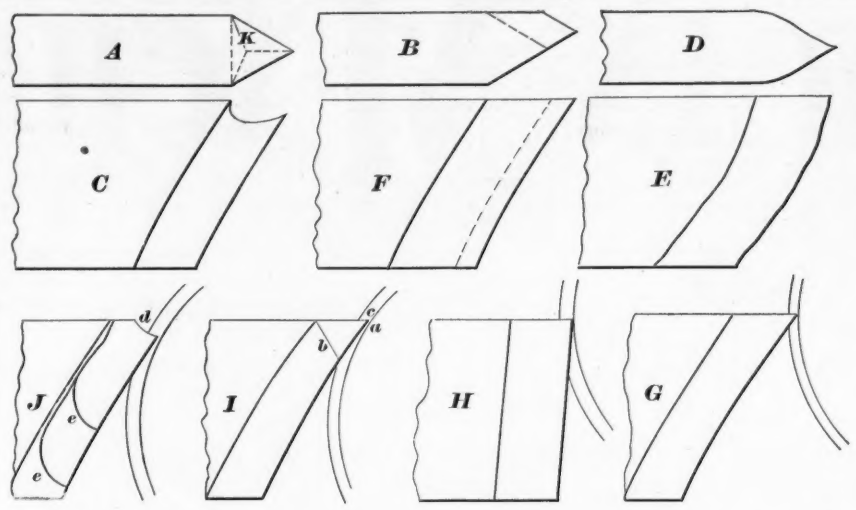
Grinding and Using Cutting Tools.

BY JAMES F. HOBART.

Watch a man grind a tool. There is one stone in each story of the shop, and the shop is 90 feet long. Tom has to walk 40 feet to the stone, and 40 feet back again, every time he wants to grind a tool, and that happens, perhaps, forty times a day. It takes a minute to go to the stone and back again. The lathe loafs another minute. About 300 days in the year Tom tramps this journey. It costs just $120 in 12 months' calling Tom and his lathe at 60 cents per hour. Ten of Tom's shopmates do the same thing, and all the boys up-stairs walk this beat as regularly as navy-yard marines. Perhaps a machinist gets into the habit of tramping in this manner, and takes to sleeper-counting naturally.

Just $1,200 a year lost on each floor of the shop. It would be an awful waste of money to rig six emery wheels in different parts of that floor. Yes! Six wheels, at $25 per rig, would cost $150, and $50 worth of wheels each year would make it cost $200. Nine-tenths of the tramping would be done away with, leaving $120, and making the whole $320. Just $880 would be saved the first year, and $1,080 each succeeding year. Don't waste your money in buying emery wheels. Tom will get so lazy in six months that he won't grind on the nasty, wet stone any way. Watch him approach the grind stone. He steps over a pair of flange coup lings, jumps a 30″ pulley, and climbs over a piece of shafting. The stone is dry. Tom grabs hold of a piece of board that sticks out of the grindstone trough. He flops that board up and down until the stone is covered with water and mud. Nobody remembers when that trough held water enough to reach the stone. If it gets dried almost like putty,

Tom will get about half a pail of water and pour it into the trough. He knows how to grind, if he is lazy about the water business. He don't grind a side tool as he would grind a carpenter's plane iron. He learned better than that, after getting his fingers jammed and knuckles barked. Tom gets on the side of the stone that runs up and from him. The tool can't catch and dig into the stone when grinding from that side of it, but it will not cut quite as fast, and the mud don't fly half as bad. See how he holds that thread tool. A piece of cast iron lays across the top of the frame; Tom pushes it close against the stone, lays the top of the tool (upside down) on the cast iron rest, and presses the tool against the stone. He soon looks at it, turns it 60°, and grinds the other side. He don't grind the first side clear down and then begin on the other side, the way Charlie does. Charlie's job looks like *B*, and he has to grind clear down to the dotted line. That don't pay; it wasted steel enough to cut threads a whole week. When Charlie was grinding down to the dotted line, a "feather edge" started up all along the point of the tool. Charlie scratched it off on a post. He grinds a little more and scratches again. That post looks like the outside of a bear's tree. Everybody scratches off feather edges on that post. It got scratched nearly through, and the boss fastened an oak plank on it. Lots of good steel is wasted; Charlie don't have to scratch unless he has wasted steel. Tom don't ever scratch unless he is grinding a new tool, and it is not shaped just right. When he gets a thread tool ground to suit him, it looks like *A* and *C*.



The curve just fits the stone. You don't catch Tom with a tool ground like *D* and *E*. When Tom sharpens a tool, he don't touch the bevels. They are just right, and he lets them alone. He grinds off the top of the tool just like *F*. He can lay it down on the cast-iron rest, and grind it square and true every time. No scratching there; no steel wasted, either.

Tom wanted to cut a No. 11 thread on a 2″ wrought iron pipe. "You can use about any shaped tool," said he, "if you run the lathe slow enough. Now, if we put this tool on the center, like *G*, and run the lathe 100 turns a minute, it won't take long to dull it. If we run the lathe at 50, it stands pretty well, but it is awful slow work."

"Put in a tool like *H*, and it will bear more speed, but it will chatter if run very fast. The strain comes exactly crosswise of the tool. When we are taking the last cut with almost a full thread, we have almost $\frac{1}{4}$″ of cut. If we should do this when we are turning a 2″ shaft, we should expect a light tool like this to spring and chatter, especially if it was a tool ground just right to cut cast iron with, as *H* is."

"Put the tool up above the center, like *I*," said Tom. "Now the strain comes more in line with the length of the tool. The face of the tool at *a* is almost tangent to the work. There is but very little clearance, and if the tool springs into the work, it strikes at *a*. It can't chatter. You can run the lathe nearly 150 revolutions per minute. But there is just one 'out' about it. The point of the tool cuts the bottom of the thread before the outer edge is cut, so that tool works just like driving a wedge around a tree just under the bark. It is *sure* to split it off, and this tool will crumble and break off the thread. Just as you get it cut full, off it will go, every time."

If we grind off the end of the tool to the dotted line, *b* on *I*, we shall make it cut the outside of the thread first, but it will work just like the old-fashioned *squash* taps and dies, and we should want a back rest bigger than the work. Grind off a little, as at *J*. Now we get just the same cutting angle that we have at *H*, but we get the strain in the same direction as at *I*, and we can run the lathe 100 turns a minute. Take a big chip, and the tool stands first-rate.

"Here is the way a thread tool ought to be made," said Tom, making half a dozen marks on his boot leg with a piece of chalk. "Cut the top of the tool like *K*, and it will be a double diamond point." Some chaps have got the idea that a diamond point tool must be knocked over sidewise to make it cut. Now, a thread tool don't need to have any side rake to cut either left or right-hand threads, unless it is for threads on small iron with a large pitch. Then the tool has to be twisted in order to get it into the thread. *K* will cut very easy, stand a heavy cut and high speed, but you can't sharpen it to any advantage.

"Just think of a twist drill," said Tom, as he held a brush full of oil against the thread, "and you have got something to pattern after when you are grinding a thread tool or any other tool. The nearer you can get to the conditions a twist drill works under, the more iron you can cut off with the least power and time."

You want to get the cutting angle at *J* as near like the lip of a twist drill as possible. Take a 1$\frac{1}{2}$″ flat drill; it has got to be first-class to stand running 100 turns a minute. In wrought iron it will make the oil smoke if you run it 60, but a good twist drill will work right up to 125 or 140 per minute and not make a bit of fuss about it. Now, we want to hit the "happy medium" between the dotted line *b* and the sharp tool *c*, Fig. I. When we hit the right shape, it will be just about the angle of a twist drill lip, as at *J*.

"It is easy to grind this kind of a tool," said Tom. "A couple of rubs at *d* brings it up sharp, and I can grind clear down to *e*. I get $\frac{3}{4}$″ of cutting edge, and only grind the tool back $\frac{1}{4}$″. You can grind it down just as far as it has strength to hold up to the work, only you must set the tool higher as you grind it down.

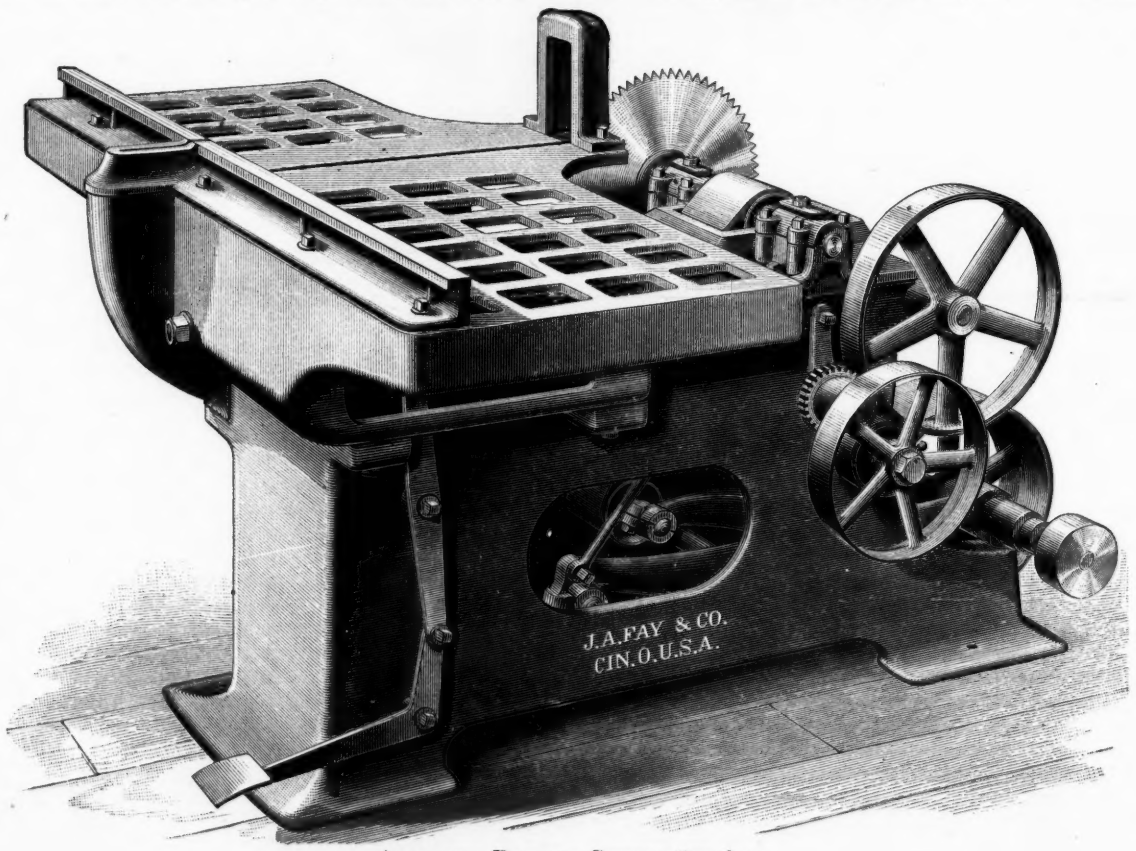
"There's one more thing that lots of boys get left on," said Tom, "and that is in working brass without oil." Sometimes you notice a chap drilling a pretty deep hole in a piece of brass. Sometimes that drill squeals worse than a drove of Indiana hogs. He can't make it cut fast. The faster it runs the worse it will squeal, and the worse the squeal the slower the cut. It seems to fill the hole "chuck full of squeal," but if he uses a little oil, then that drill goes right about its business. Cutting threads on brass needs oil, too, and you get rid of that unearthly chatter that makes all the boys look over to your lathe and wish something would break.

"A common side tool is hardly ever treated as it should be. Not half of the boys know what that tool is capable of," said Tom, as he took his job out of the lathe. "I know of some shops where they do about all their turning with side tools. They even use a stunt ground tool for cast iron. A well-made side tool will stand more than two diamond points. If you want to take a cut $\frac{1}{4}$″ deep, a diamond point tool will cut nearly $\frac{3}{8}$″, owing to the angle it makes with the work as it stands at about 80° with the line of the centers. Now, if there is any spring to the tool (and we never saw one yet that didn't spring), it will dig right into the work and gauge out nasty flat places. A good side tool, set at an angle of 70° or 80°, but the point of the tool toward the tailstock, will spring out of the work when it springs at all, but much of the tendency to spring can be done away with by proper forging and grinding. A side tool wants just enough "side rake" or clearance to make it draw to the work without springing out or gouging in.

A great deal of it depends on the "twist." It requires a "knack" to twist a side tool just right. It should all be offset at the *top*. The bottom must be perfectly straight. Don't play any lightning-rod games on a side tool. Don't put it in the vise and twist the offset into it. Lay it on the anvil so the part to be offset projects over the shoulder at the back. Strike with a hammer close to the shoulder, and on the top side of the tool. Drive it over more than you want it when finished, then straighten back the lower edge of the tool. Don't give a side tool too much end rake. Just enough for clearance works best. For wrought iron it can be ground very raking sidewise, and if the "twist" of the tool is just right, it will not, as before stated, draw into the work or spring out.

There is no tool made that will take as nice a "water cut" as a side tool will. Grind it up nice and sharp, then grind off the point a little. Hold the tool to the stone at just exactly the angle at which it is to cut when in the lathe. Grind the end of the tool until it shows a face about .02″ wider than the cut you intend to take. Rock the tool sidewise once or twice to remove the sharp corners, then set a good edge on an oil stone, and then set the tool so the end face will be parallel with the work. Run at high speed, 150 feet per minute; use clean water, and that tool will cut so smooth that the surface it leaves bears a good polish.

Automatic Railway Cutting-Off Saw.



Automatic Railway Cutting-Off Saw.

The machine here represented is designed for cutting up to accurate lengths all kinds of material used in furniture, agricultural, carriage and buggy shops, sash and door factories, planing mills, etc. It is a substantial and powerful machine. It is automatic in its operation, the saw being propelled back and forth by means of the cha feed, actuated by the feed leve in front. The frame is formed of one heavy casting, with large floor base, rendering it self-contained. The countershaft is attached to the base of the machine, and can be belted from above or below the floor. The guide rails for supporting the traveling carriage are wide and heavy, and cast to the frame, securing great permanence in this most important part of the machine. The arbor is of large diameter, made of best steel, and runs in a connected gateway, having self-oiling bearings. The end of the arbor is provided with a device for increasing the size, allowing the use of saws with varying sizes of holes without the necessity of bushing. The sliding gateway is actuated on the planed guides of the frame by feed mechanism, which by simply pressing upon the lever in front of the machine causes the saw to travel in either direction as may be desired. Adjustable stops are provided for regulating the distance the saw is made to travel in, to suit the different widths of material to be cut off. The table is made of iron, attached to the machine in a substantial manner, and provided with a board measure accurately spaced into inches for convenience to the operator.

The tight and loose pulleys are 10″x4″, and should make 700 revolutions per minute.

The manufacturers are J. A. Fay & Co., Cincinnati, Ohio.

The success of the New York elevated railroads has led to the building of similar roads in other cities. Brooklyn has one seven miles long nearly ready to begin operations and contracts for building another one are about to be given out.

Milling Taper Work.

By Fred. J. Miller.

In a former article, where I had written *preferable*, the printer made me say *perfectly*, thus making me appear as the advocate of "perfectly round" keys for driving milling cutters. Having had some experience at trying to make things *perfectly round*, I have some appreciation of the difficulty and expense connected with the process, and would hardly recommend such work to be used for keys, especially since they would be no better than ordinary round wire. I have used pieces of steel wire, cutting it into lengths a little less than the thickness of the cutters. This makes a half-round groove in the arbor, and the same in the cutter, and the advantages are that the distance-washers need not be made to go over the key, but can be left as they come from the key; and there being no key permanently fitted into the arbor it is much less liable to be sprung out of truth; and there being no square corners in the key-way of the cutter, there is much less liability of starting a crack there in hardening; and, finally, the whole arrangement is cheaper, neater, and more convenient to use than square keys permanently fitted to the arbor in the usual way.

Some time ago, there appeared in this paper a drawing and description of a dog, for use with the Brown & Sharpe Universal Milling Machine, contributed, if I remember rightly, by a foreman of the Morse Twist Drill and Machine Company's Works. This dog was especially designed for use in milling taper work, and was supposed to adapt itself to any and all variations of angle between the center line of the work and that of the dividing head spindle without cramping, and it was claimed for it that it did away with the only objection to the Brown & Sharpe machine. I believed all that was claimed in its behalf until I commenced to examine it closely, with a view to making one, when I discovered that it only overcame one-half of the cramping difficulty, and that in order to make a truly universal dog it would have to be capable of several additional movements. Several of my mechanical friends became interested in the problem of devising one, and the fruits of our labors are represented by figures 1, 2, and 3, one of them being designed by a well known M. E. They are all of them truly universal; that is to say, they cannot be cramped by any angle which comes within the limit of their motion. I trust they will readily be understood from the drawings; and it will be seen that they all require good workmanship in their construction to make them satisfactory.

Fig. 1, perhaps, needs no explanation; it seems to be capable of a good many motions, but, upon trial, none of them will be found unnecessary. It is a modification of the familiar universal joint.

In Fig. 2 the pieces *b* and *c*, when the dog is in use, have a spiral oscillating motion in the pieces *a* and *d*, besides which use will be found for the joint between *b* and *c*.

In Fig. 3 the piece marked *b* has a ball upon its extremity, which is capable of motion of most any kind in the fork of the piece *a*. They all have their friends, some preferring one kind and some another, and the reader can take his choice.

Now, although any one of the above three breeds of dogs will be found to work very satisfactorily, so far as freedom from cramping in any position is concerned, yet I do not think they do away with the only objection to the Brown & Sharpe machine, because one objection consists in the necessity for any such dogs. And now, if, by presenting these dogs, I have conferred any benefit upon the fraternity of toolmakers, I can, perhaps, confer a greater benefit by showing how they may be dispensed with, and a common cur made to answer for all kinds of work.

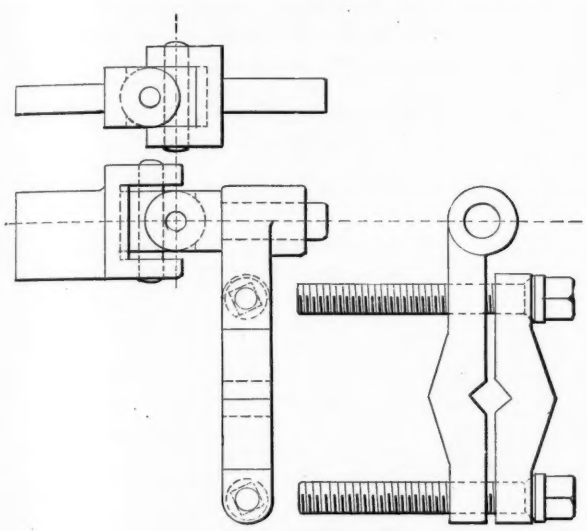


Fig. 1

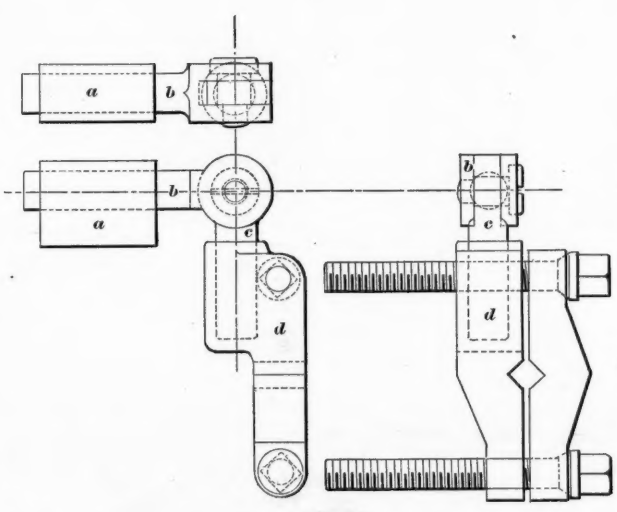


Fig. 2

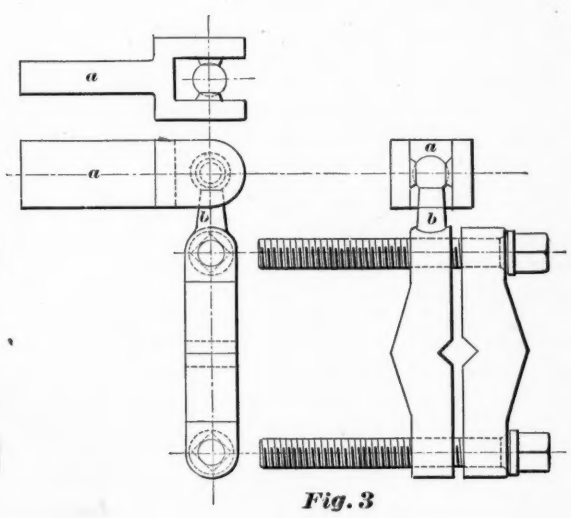


Fig. 3

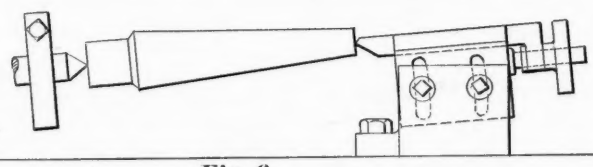


Fig. 6

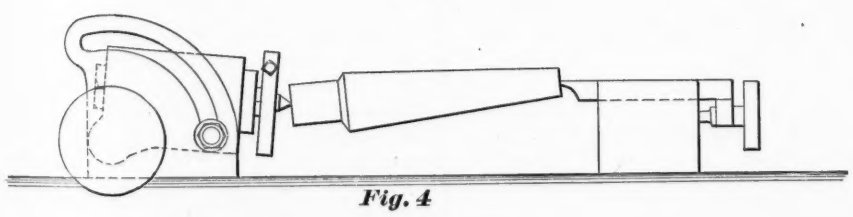


Fig. 4

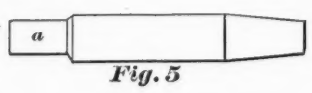


Fig. 5

No matter what kind of dog is used for holding taper work upon centers while being milled, if the centers must be be placed out of line with each other, as in Fig. 4, in order to get the required taper, the accuracy of the divisions or indexing is entirely vitiated.

This is especially noticeable and annoying when a reamer such as is shown in Fig. 5, is to be milled with continuous cuts, or flutes from the small end to the shank *a*. On a piece of this kind it is necessary to depress one center while milling the taper part; then when the centers are restored to the normal position for continuing the flutes over the straight portion, it will be found that only two of them will correspond at all, these two having been milled when the tail of the dog was in a vertical line above and beneath the centers.

Of course the others can be made to match, but this involves considerable trouble, and after it is done they will not be evenly spaced. The milling of a taper piece of square section would be almost an impossibility under such circumstances. By taking pains to have the dog in the proper position, as indicated above, two sides of the section might be made parallel with each other, but the other two would be neither parallel with each other nor at right angles to the first two, and the section instead of being a square would be what the geometricians would call a trapezoid.

A device for overcoming this difficulty is in use to some extent, and consists essentially of an adjustable tail block, or center, in connection with the ordinary elevating head, something as shown at Fig. 6.

This is ingenious and may be said to overcome the difficulty, inasmuch as it can be said that by its use it is possible to correctly index taper work. But the centers having to be adjusted separately, one after the other, it is exceedingly difficult to secure the precise adjustment necessary to do a good piece of work; indeed it is almost what has been called a "corrugated impossibility." Taking the case of taper reamers, for instance: if the proper angle of elevation for the centers bore any fixed relation to the taper of the reamers and was computable, matters would be much simplified. But this is not the case, the angle at which the centers must be set depending upon the pitch of the teeth of the reamer and the shape of the cutter used in milling them, as well as upon the taper of the reamer, so that calculations are impracticable.

This makes it necessary to "cut and try" a process which, with a device in which the centers are capable of movement independent of each other is anything but economical or pacifying.

I therefore submit the plan shown in Fig. 7, which is an attachment that may be adapted to any machine having an elevating head.

In this device the centers are per force kept always in line with each other, consequently it is very little trouble to adjust, and it will produce taper work as accurately indexed as straight work can be. When used upon the Brown & Sharpe machine it enables true spirals to be cut upon taper work, with the well known advantages of holding the work upon centers at the same time. It will also be found useful for bevel gearing within certain limits.

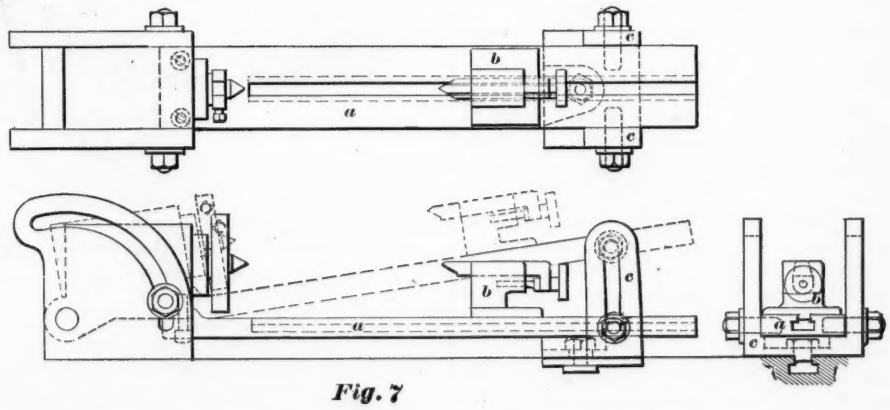


Fig. 7

The piece *a* is a sort of supplementary table to the machine, which is attached to the elevating head by two screws as shown. Upon this is mounted the small tail block *b*, and its outer end is supported by the slotted arc *c*, which is secured to the table of the machine by the bolt shown.

It will be found easy to put on and remove from the machine, and obviates the necessity for any fancy breeds of dogs.

The French cruiser La Clocheterie sank last month while preparing to leave Cherbourg harbor on her trial trip. The boat was not built by John Roach, but in the best naval yard belonging to the French Government. Our national critics who can see nothing good turned out by American workmen must feel bad that the accident did not happen to one of our new cruisers. What a howl would have gone forth had this been the case! The ridicule heaped upon our ship-builders would have stopped appropriations for new ships for five years.

Mr. D. M. Gugel, master mechanic of the Central and Southwestern Railroad of Georgia, is taking the Westinghouse air-brake reservoirs out from under the foot-board of his locomotives, and placing them on top of the boiler just behind the smoke-stack. He makes the change to avoid the difficulties of doing anything to the reservoir in the inconvenient position it usually holds. An objection raised against the change is that it reduces the adhesion of the locomotive. The decrease of weight due to changing the reservoir is so small as to be practically of no consequence. All things considered, we believe the change to be a good one.

Our English industrial exchanges are all faithful advocates of free trade, but recent events lead us to believe they do not favor taking away all artificial restrictions of trade between nations, because it is morally just or philosophically correct, so much as because free trade is likely to benefit English manufacturers. There has been remarkable unanimity among them in denouncing their government for purchasing pumps for the Soudan pipe line from Worthington, our American company. Yet the British government was merely following the policy the press of that country are so ready in recommending to other nations. But even there it makes a difference whose ox is gored.

The Soudan Railroad.

The British Government has determined that the railroad through the desert of the Soudan, from Suakim to Berber, a distance of 245 miles, shall be standard gauge, and all the energy of the department will be exerted in pushing it through this season. The route is said to present no serious physical obstacles to the rapid building of a railroad, so there ought to be no difficulty in getting the road completed within four months after the first vessel carrying the labor and plant arrives at the base of operations. British engineers are not, however, famous for expedition in pushing forward railroad work. There is generally too much devotion paid to following established rules and precedents, and the system of using iron chairs for the rails to rest on, with all the additional parts entailed, is not conducive to rapid laying of track. From what we know of German military performance in rapid railroad building, we are not sanguine of the British war office getting their railroad built so rapidly as necessary. In connection with the siege of Metz, the Germans had to build a short railroad 23 miles long. All the assistance that an unlimited supply of men and money could provide was called on to push the work, and the difficulties of construction were light, yet they were fifty days in getting the first train over that short line.

If the contractors engaged by the British Government to build the road from Suakim to Berber cannot guarantee to push the work through at the rate of two miles a day, they had better turn it over to American railroad builders, who will, no doubt, undertake the job and perform it on time. Our rough-and-ready methods of railroad construction are often objectionable for permanent structures, since they frequently entail inferior work, but they are good for emergencies where quick transit is essential.

Mr. Frank C. Smith, so well known as a writer in the AMERICAN MACHINIST, has been appointed master mechanic of a railroad in Florida.

An English Engineer on American Machinery.

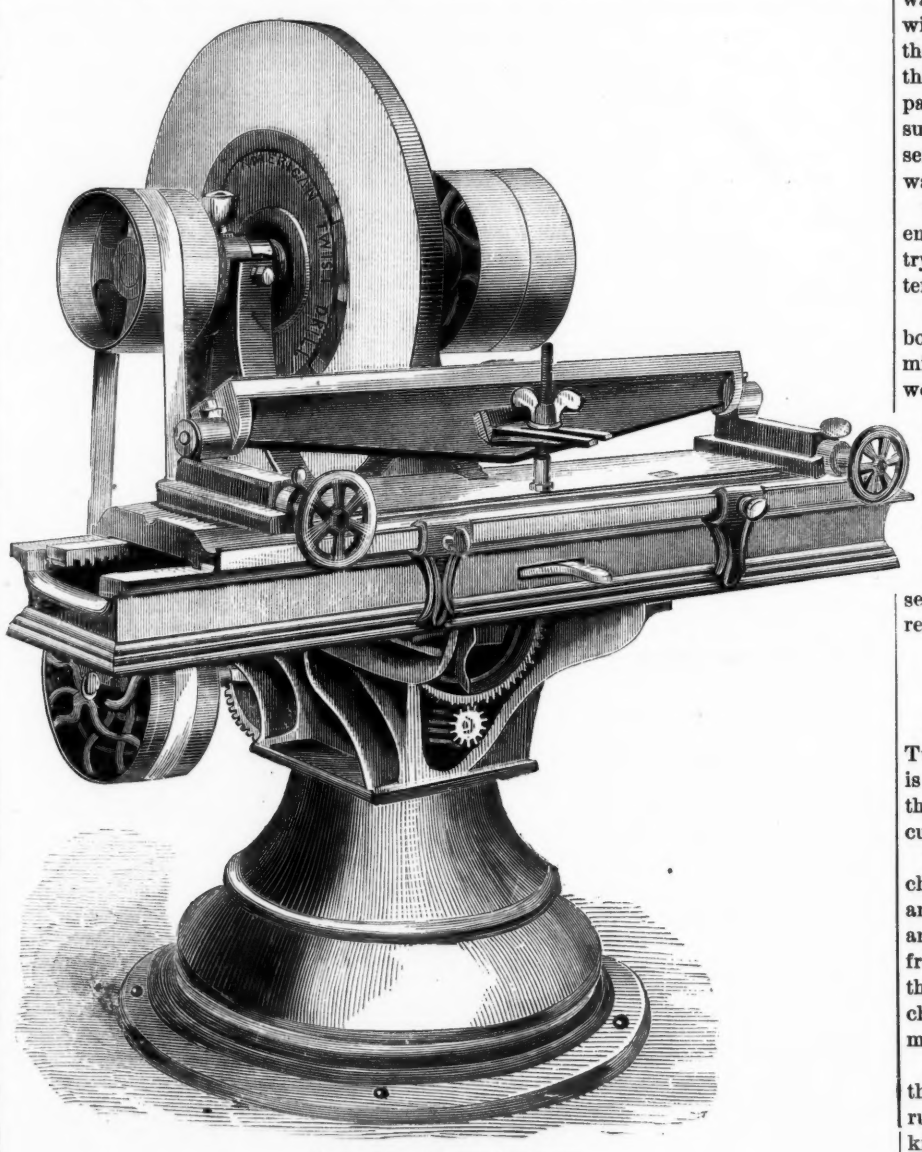
Mr. Arthur Rigg, C. E., in the course of a paper, read before the Society of Engineers on American engineering enterprise, says:

"Those who commence doing everything which imperfect knowledge considers cheap are little aware how wide-spreading are the consequences of such an opinion being entertained by themselves and communicated to their work people. That idea not only saps the foundations of permanent success, but also poisons the springs of all honest dealing. It acts by the force of an evil example, and consequently depreciates the quality of manufactures. Many of our goods are already nearly driven out of foreign markets in spite of our immeasurable advantages, and are being replaced by the productions of America and foreign countries. If there is much to see and admire in Canada and the United States, there is nothing more worthy of imitation than the system which prevails there to so large an extent, of having the best of everything, whatever it may seem to cost—a system which insures prosperity to trade, self-respect to the manufacturer, and one that is consonant not only with the sound principles of political economy, but also with ordinary common sense. Some people seem imbued with an idea that anything said in praise of either American or of foreign workmanship involves an unpatriotic distinction of what we produce at home. This is a very narrow view of things, for without having any sympathy with that cosmopolitan philanthropy, which exalts every country at the expense of our own, it is plain that we can never indulge a generous ambition, nor aspire to lead the van of progress, if we shut our eyes wilfully to what goes on in the world around.

"There are no countries from which we can more fairly take example than those whose original inhabitants came from this. America has been peopled by the more energetic of our own race, who now possess a country of marvelous internal resources. By the help of their laws, and to their enormous gain, new inventions are eagerly sought after, and talent meets great encouragement. There a man does not need to labor for many long years in perfecting an invention, taking the doubtful protection of those statutes of limitation called our Patent Laws, only at last to find his ideas appropriated by another—a pirate who takes undue advantage of the numerous pitfalls by which an inventor is encompassed. And for another reason, it is no wonder that foreign countries get ahead of us, when even their governments wisely encourage every new departure, every improvement in existing methods. With them there is little of that nervous timidity about anything out of the beaten track, and none of that provoking interference due to the conceited half-knowledge of those who have learnt enough engineering to meddle with and spoil what they cannot understand. Abroad, engineers are more fully trusted than here, and they are therefore more free to obey the sound maxims—Make sure first of those general principles you intend to apply; then trust them implicitly; and, finally, never be afraid to carry them out.

"The direct adaptation of tools to their intended purpose is very noticeable in all American machinery. In their planing machines, for example, everything is done to facilitate the attendant's labors by numerous little devices. The handles are arranged all ready for his use; and, as the table runs quickly back, its catch strikes against an elastic lever, and so moves the narrow belt with the utmost quietness, and only about half the distance needed for an English machine. Then this action puts a friction pall into gear, and it deliberately advances the tool for another cut. The driving pulleys of these machines are ranged along the side, so they need not be placed across the line of main shafting as with ours, and, altogether, this one example might serve as a text for a long dissertation upon the art of intelligent design, more particularly as contrasted with the clumsy planing machines which satisfy people here. Indeed, at one of our works the proprietor showed the writer an American machine for a different purpose, that was working well and with the utmost silence; while, not far away, was another doing corresponding work, and bearing the name of a large firm in this country. This latter was creating a deafening noise, and seemed as if concentrating its energies upon self-destruction every few minutes. A barbarous design, most appropriately named by its owner, as we left it, 'Brute Force and Ignorance.'

"In setting out manufacturing establishments of the best class in America, one cannot fail to notice that the object kept steadily in view is the need of cheap production with the disadvantage of expensive labor; and to this end the original first cost of machinery is considered of far less importance than any diminution of its productiveness, for that would be a continual drain upon profits. Settling the commercial aspects of any manufacturing concern may not lie strictly within the province of an engineer, but it ought to receive from him an amount of attention equal to its importance. That point where interest on first cost balances annual expenditure can be determined by very simple calculations, for if we assume capital all to be borrowed, and the machinery constantly in full work for fifty hours a week; and further, that a return of 10 per cent. per annum just covers interest, repairs, and depreciation, then it follows that unless an investment gives more than 10 per cent. it is not worth making. All excess over such interest becomes clear profit, and is frequently found enough to justify an opinion that no investment yields so high a return as first-rate machinery fully employed; and this is further illustrated by the old Lancashire saying, that it is always worth investing £1,000 to save the annual cost of one man's labor."



AUTOMATIC KNIFE GRINDER.

It is admitted (by the over-production political economists) that our hard times originate in the fact that we raise too much food, manufacture too much clothing, and dig too much coal, and that the consequence is that a great number of our people are compelled to endure cold, wear rags and suffer hunger, while all the rest live in dread of poverty and desolation because of their accumulated and still accumulating surplus of valuable things.—*Hayes Valley (Cal.) Advertiser.*

A Silver Piston Gland.

A machine-making company in New York city have made quite a number of heavy engines for the mining districts of Mexico and South America. The machinery was peculiar, in the fact that every piece had to be made in sections light enough to be carried on the back of a mule. Some difficulty was encountered at first in getting cylinders made up into a dozen sections, but it was a new case of difficulty being the mother of invention, and was successfully accomplished. When the mules are winding their way along the defiles of mountain fastnesses with part of a steam engine on their backs, they occasionally slip over a precipice, and the section is lost or destroyed; but each part is made to interchangeable sizes, so in such a case the number of the lost piece is sent to the maker and a substitute is forwarded to take its place.

The machinists who go along to put these engines and machinery together, have some trying calls upon their ingenuity to make temporary substitutes for missing pieces.

We heard of a case where the stuffing-box gland of the cylinder was found to be missing when the engine was put up. They were anxious to start up, and the machinist made a gland from a piece of hard wood, but could not make it hold the packing. In the neighborhood, there was, belonging to the company that owned the engine, a furnace for smelting silver from the ore. The machinist made a pattern, and had a gland of silver cast, and used it on his engine for several months, till the missing gland was replaced by a new one from New York.

Automatic Knife Grinder.

This machine, made by the American Twist Drill Company, Meredithville, N. H., is designed for grinding long knives, such as those used on wood planing machines, for cutting paper, etc.

The knife is ground entirely by the machine, which is automatic in its operation, and can be set to traverse the knife forward and back against the wheel any distance from two inches upward. It is claimed that a long knife can be fastened to the machine, adjusted and ground straight in ten minutes.

A solid emery wheel, made expressly for the machine, is used without water, being run slowly to avoid all danger of heating the knife.

Condition Contrasts in New York.

The Rev. Wilbur Crafts, a popular New York preacher, discoursing recently on the condition of labor and laborers in and around New York, made some striking contrasts between the condition of different portions of the population. "In this city," he said, "there are four hundred millionaires, and at present eighty thousand people destitute of the means of obtaining food, and there is no good systematic method for preventing starvation. The increase of labor-saving machinery, which ought to be a blessing by enabling a man to earn a livelihood, by working fewer hours, produces different results. One portion of the population is now overworked, while the remainder are idle.

"The United States Government sets a very bad example to unscrupulous employers in the manner it treats its employés. The letter-carriers of New York are worse treated than any other class of workmen, except it be the employés of the street car companies.

"Letter carriers, in many instances, are made to work twelve or fourteen hours a day, and in some cases seven days a week.'

If the proposed American Exhibition to be held in London during the summer of 1886 does not prove a success, it will not be for want of energy and push on the part of its promoters. They have started a paper called the *American Eagle*, which will be devoted to advancing the interest of the exhibition. The first issue has a long list of patrons of the proposed exhibition and it embraces many of the most eminent names in the United Kingdom. It is desired to make a thoroughly good exhibit of the American system of manufacturing interchangeable parts. The chances are that our European friends will reap more benefit from this than the parties showing their perfected method of production.

Whitney's Combined Ratchet Drill Stock.

The engraving represents a ratchet drill stock, made by P. A. Whitney, Chagrin Falls, Ohio. It is provided with two screws. By using the short one it is adapted for working in small space which is usually a requisite in boiler makers practice; by substituting the long screw it becomes an ordinary ratchet. This feature gives the tool a range for which it is generally necessary to use two ratchets.

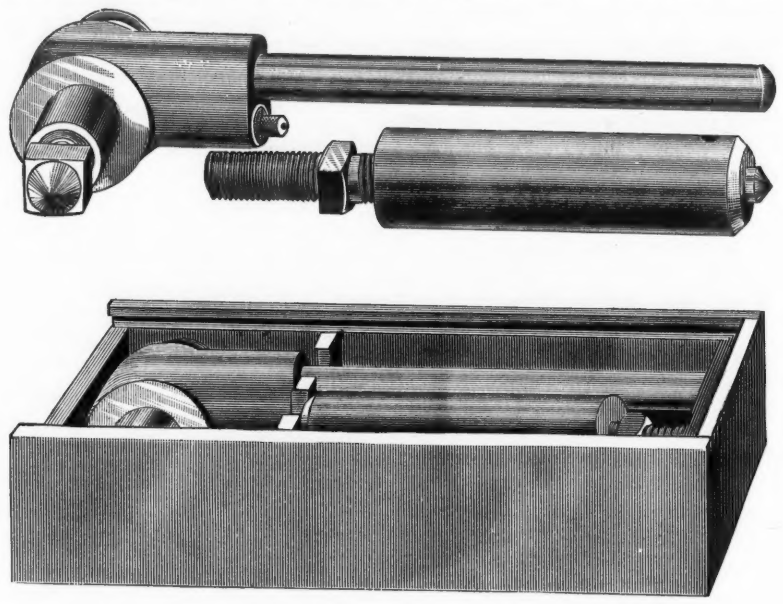
It is reversible, which every mechanic who has had occasion to drill out broken studs will appreciate; it is also convenient in light drilling.

The ratchet and socket are of one piece of forged steel, with no chance to split or move. The working parts are all encased, protecting them from dirt and chips.

The screws are of large diameter, and long, at the same time the tool is compact, economizing space.

All parts are made interchangeable, and the ratchet is packed complete in box with slide cover, as shown.

Either twist or flat drills are furnished with ratchet when desired.

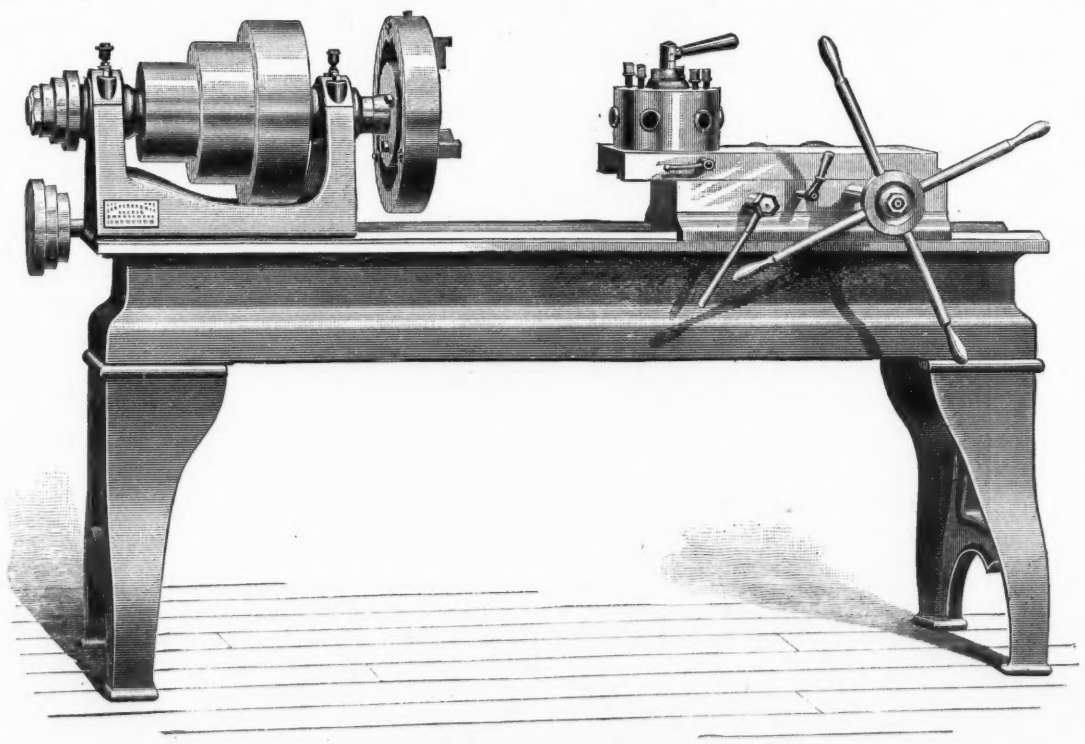


WHITNEY'S RATCHET DRILL STOCK.

The New York Central, the Boston and Albany, the Lake Shore and Michigan Central railroad companies have concluded to adopt the Ames automatic car coupler for all their freight-car equipment. The mechanical departments of these roads have agreed to use a standard form of the coupler named, drawings being made to establish all the dimensions. The individual roads agree not to make the least change without coming to an agreement with the others. This is a very important move in the right direction, and, if followed out, may lead to a general adoption of an important standard without waiting on the dilatory action of the Master Car Builders' Association.

New Chucking Lathe.

The use of special chucking lathes is, in machine shop practice, not so common as it should be. The time consumed in changing chucks for face plates and *vice versa* on engine lathes is a serious item, besides where special chucking lathes are used the tools,—drills, etc.,—are kept in readiness for use without delay.



NEW CHUCKING LATHE.

The chucking lathe represented herewith, is made by Lodge, Barker & Co., Cincinnati, Ohio. It swings 19″, and has a bed 6 feet in length.

The cone pulley has three changes, for 3½ inch belt. The largest cone is 15″ diameter. Two changes of speed are provided on countershaft, making six changes of speed altogether.

The spindle is hollow, having a hole its entire length of 1½″ diameter; both bearings 2½″ diameter; has steel bushings bored 1¼″ unless otherwise ordered.

The turret slide is operated by a pilot wheel, boring holes up to 15″ in length. Power feed is provided, which is thrown in and out from front side of turret.

Work in the Bement Shops.

There are some unusually heavy machine tools in course of construction in the works of W. B. Bement & Son, Philadelphia, and others quite novel in design. There is just finished for their own use a boring mill capable of taking in a piece of work 120 inches diameter, which will be a very convenient tool for many purposes. The heads are so designed that they work independent of each other in any direction—one may be surfacing while the other is boring. The mill has ten different speeds, five by the cone and five by means of two counter pulleys. The foundation is six feet deep, of brick, and the tool is set in a bed of sulphur. There is a huge lathe, with a bed 70 feet long. The bed has double ways half the distance of its length. The lathe can swing 60 inches, and is capable of taking in a shaft 58 feet long. When complete, this lathe weighs about 60 tons. A double-headed axle lathe, just finished, looks like a tool that would put through axles very rapidly. It is double-geared, and has a crane set in the middle for handling work. A quartering machine for locomotive driving wheels, that is nearly finished, will do the work to the one-thousandth of an inch, and its construction insures its remaining true for many years, it being exceedingly stiff and rigid. This is a rather expensive special tool, but it would pay well for many railroad companies to have it, for there is more destruction caused to locomotive machinery by inaccurately quartered wheels than is usually supposed. We remember a case where a new locomotive turned out of railroad shop, knocked pins, rods and cylinders to pieces through the fault of inaccurate quartering, and many engines, that are not bad enough out, to break the pins, keep twisting rods and boxes out of shape.

There are two four-headed planers that work a piece 78 inches by 25 feet, the post-heads being so designed as to swivel the tool to any angle. A combined boring, drilling, and milling machine, being built for the Chicago & Alton Railroad Company, is a kind of tool we have never before seen in this country. A locomotive cylinder can be almost finished on this machine. It can be bored out, the heads turned off, the valve-seats milled, and all the holes drilled. In some cases two tools can be at work at the same time.

From Mr. Ives, President of the Cedar Rapids & Northern Railway, Cedar Rapids, Iowa, we learn that the Locomotive Improvement Company's engine, with the traction increaser attachment, has made a trip over his road and pulled a very heavy train without trouble. Mr. Ives says they are having a very good business. The weather has been cold but bright during this month (March), but no snow, and the earnings have been $40,000 ahead of those of the corresponding month last year.

Citizens of Savanah, Ga., are agitating an investigrtion of the question whether the iron ties which are now the universal substitute for rope in binding cotton in bales are not the cause of the increase of modern cotton fires. The contact of the iron buckle with hard substances in the rolling of bales, or their jolting in transportation, has been found, on occasions, to produce sparks.—*Fireman's Herald.*

LETTERS FROM PRACTICAL MEN.

Making and Using Rawhide Wheels.

Editor American Machinist:

I am moved by your request for information from parties making rawhide gearing, etc., to state that, while I cannot say I am manufacturing such articles, I frequently have made use of rawhide for gear wheels during the past twelve years, and am now designing a machine that will contain 18 such gears of two to three inches diameter, and about two-inch face. I am a little uncertain as to your meaning of "compressed" rawhide, whether it is rawhide formed into solid bodies by hydrostatic or other heavy compressing machinery, or whether compression by simple machine-shop facilities will answer the description.

When I want the *best* pinion possible—in my mind—to make of any known substance. I cut out a number of disks of rawhide, place them on a flanged sleeve similar to the core of a paper friction pulley, and screw a collar up as tight as possible, meanwhile warming the blank for an hour or two up to about 200° Fah. The warming has the effect of allowing the disks to lie closer together, by becoming straightened out. I turn and cut such gears as I would iron, and I have not the slightest difficulty in making entirely noiseless gearing. I have never known one of these gears to break or show symptoms of wearing out.

I have in mind one machine I made five years ago, where one 6″x2¼″ rawhide bevel pinion has run 500 revolutions per minute, driving a machine for making wire staples almost constantly since, yet showing no signs of yielding. The pinion runs two 12″ diameter bevel wheels in opposite directions, and the duty of these is to cut and bend 1,600 wire staples (from No. 14 wire) per minute.

Chicago, Ill. C. C. HILL.

Curious Electrical Disturbance.

Editor American Machinist:

During an experience of over twenty-five years in using wood-working machinery, the writer never felt the action of electricity in the manner it manifested itself on the 10th of March in a factory at Paterson, N. J.

While a workman was sawing pine strips he felt sharp electrical shocks whenever his hands came in contact with any iron part of the saw table, even to the floor. The shocks were a little stronger than those felt when the fingers are brought near a cross belt which is electrically charged. There was the same snapping sound, and in certain localities about the table the bluish sparks could be distinctly seen. At the time, the room was quite cool; the temperature out of doors 12° above zero, a high barometer, wind fresh from the N. W., and a cloudless sky. Upon removing the saw blade, and running the arbor, the effects were just as marked, nor did they cease when the belts belonging to the saw were greased, and the under side of the saw table sprinkled with water. During the forenoon the effect gradually wore off, to make itself felt again later in the day. On the 24th inst. the shocks were renewed with as much force as before, but strange to say, on neither occasion were the other four saw-tables in operation in the factory thus affected. It seems remarkable that such a marked electrical disturbance should make itself felt in only one machine in the room, and that for so many years nothing of the kind should have attracted our attention.

Doubtless some of your readers can throw some light on this subject, and at the same time suggest some remedy for what proved to be quite an annoyance to the sawyer.

H. W.

[We trust that some of our readers are able to give a satisfactory solution to the above,

Locomotive Draft Pipes.

Editor American Machinist:

I notice in the issue of the AMERICAN MACHINIST of March 7, in Frank C. Smith's "Various Locomotive Improvements," a note about the straight stack and nozzles, and their similarity to the injector. This arrangement is, I believe, a German invention, and there was some talk of using it on the Lehigh Valley Railroad engine you described some time ago. The way it is made in Germany is to use several cones or rings of sheet iron, placed about 2″ apart, the largest ring at the bottom on a line with the top of the exhaust nozzle, and each succeeding core or ring growing smaller as it approaches the top of the smoke-box, where it is the same diameter as the smallest diameter of the stack, which from that point flares out, making the whole a sort of ejector.

A sketch is probably unnecessary to convey my meaning. I do not know if this arrangement has ever been used yet in America or not, but understand it gives very good results in Germany. I do not think the outside appearance of the stack very fine, but suppose it is a matter of education.

T. E. AUSTIN.

Making Black Lines on White Paper.

Editor American Machinist:

Some time ago I promised the AMERICAN MACHINIST our device for making black lines on white paper. Several of your readers have written me asking if I had yet sent the article, as they had not seen it in the AMERICAN MACHINIST; would I send it? I took up the subject of a bath which caused the delay. The best results are when *no* iron baths are used, so we made one 4 ft. by 6 ft. of Portland cement, 1½ inches thick, except the bottom which is 2 inches. This we built on a table in our blue print room.

Herewith is the "Johnson-Harrington Gallate Process" There is no patent on this, and we are willing to give it to all wishing it:

Gallate Process.

SENSITIVE MIXTURE.

Sesquichloride of Iron	130 grs.
Sulphate of Iron	48 "
Tartaric Acid	48 "
Water	12 drs.
Gum Arabic (thin)	1 dr.

Exposure 20 minutes—bright sunlight.

DEVELOPING BATH.

Gallic acid	15 grs.
Tartaric acid	3 "
Sulphate of Iron	1 "
Water	16 oz.

S. H. HARRINGTON,
Chief Draftsman of P., C. and St. Louis & P. R. R. Co.
Columbus, O.

Curious Air Brake Trouble—A Question in Mechanics.

Editor American Machinist:

I will describe a curious air brake trouble. While in care of the locomotive air brakes on an Eastern road, one of the engineers reported what seemed to be an impossible failure of the brake. He could set the brakes with five pounds of air, but could not release them with less than forty, when working automatic. I thought this to be a mistake, but an examination proved it to be so, and, after considerable hunting and study, I found the cause to be that the packing of leather between the drip cup and the body of the triple valve under the tank by repeated screwing up, being of soft leather, had sloughed off, so to speak, from the joint face around the edge to the center, there forming a considerable thickness of soft spongy leather, which it took forty pounds pressure to the inch on the piston of triple valve to compress sufficiently to allow the piston to descend far enough to uncover the escape hole by means of the little slide valve in top of case; shaving off the leather in the center to the thickness of the edge cured the trouble.

I would like to ask your thinking readers: Will an ordinary locomotive air pump compress air to a pressure greater than that of the steam which drives it, the pistons being of the same diameter? Don't jump at a conclusion, and let the old law that action and reaction are equal settle it without more thought. From experiments I have made, I dare not deny the possibility, neither do I consider that I have sufficient evidence to prompt me to make the assertion.

CHAS. S. BEACH.

Gloversville, N. Y.

Smoke-Box Temperature of Locomotives — A New Perpetual Motion Scheme.

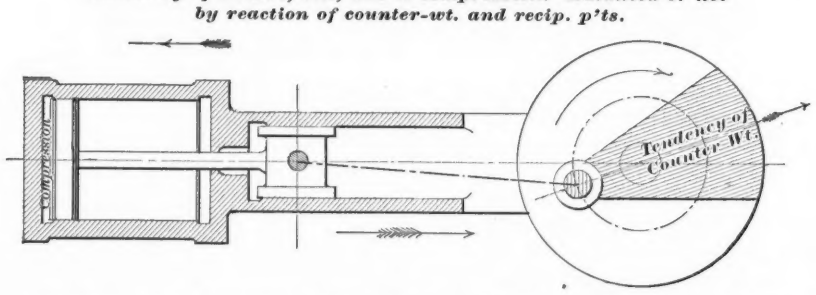
Editor American Machinist:

In searching for information in regard to the temperature of the products of combustion in the smoke-arches of locomotives, I found some difficulty in obtaining data on the subject, and thinking, perhaps, some of your readers may at some time have need of such information, I send you some notes of experiments made by Mr. Reuben Wells, when master mechanic of the J. M. and I. R. R., which he has kindly permitted me to make use of.

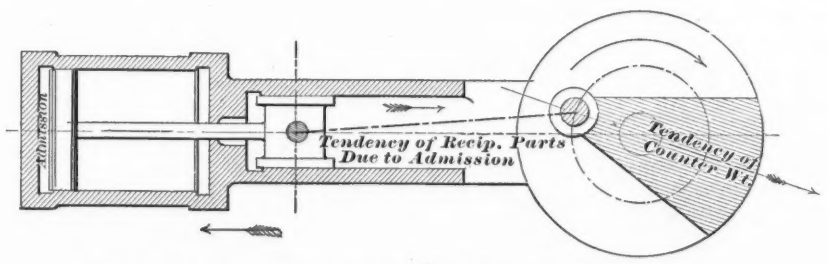
In relation to this subject, let me relate an incident showing one reason why I had some difficulty in procuring valuable data on the subject.

"Once upon a time there was a man" who built a return flue locomotive, and wanted the opinions of railroad men concerning the prospects of his engine.

Tendency of Frame, etc., due to compression. Balanced or not by reaction of counter-wt. and recip. p'ts.



Tendency of reciprocating parts when compression is more than sufficient for retardation, in which case the counter-wt. will be disturbing, beyond extent of reaction of frame, etc. due to compression.



Tendency of Frame, etc. due to admission. Balanced or not by reaction of recip. p'ts. counter-wt. disturbing.

Two experts, high in authority in the mechanical departments of two of our prominent trunk lines, were consulted in relation to the probable effect of returning the gases through the steam space of the boiler. One of these men did not hesitate to affirm that there would be so much heat in the tubes as to burn them out so rapidly that it would be foolishness to use them. The other expert assured the man that there would be not the slightest use in using the return tubes, for the simple reason that there would not be enough heat returned through them to be of any use. The result proved contrary to both opinions.

The following notes were made from a plotted curve, showing the temperature as read every minute from a pyrometer in the smoke-arch. It shows, in a striking manner, the variations caused by the force of blast and the effect of opening the fire-door. The temperatures, when not running, ranged between 450 and 475 degrees Fahr.

1. Engine with freight train of 29 loaded cars:
   Average speed while using steam, 14.5 miles per hour.
   Average steam pressure, 128 lbs.
   Size of exhaust nozzles, 2 1/16 inches.
   Total heating surface, 830 feet.
   Evaporation on a run of 432 miles and an average train of 30.7 loaded cars was 6.2 lbs. of water to 1 lb. of coal.
   While working, with steam on, the temperature ranged between 650 and 800 degrees.
   Average temperature in smoke-arch while using steam, 712 degrees.
2. Engine with 26½ loaded cars:
   Average speed while using steam, 17.5 miles per hour.
   Average steam pressure, 114 lbs.
   Exhaust nozzles, 2 1/16 inches.
   Cylinders, 16 x 24 inches.
   Evaporation on a run of 432 miles and an average train of 28.2 loaded cars was 5.54 lbs. of water to 1 lb. of coal.
   Average temperature in smoke-arch, 721 degrees.
   The curve for this run is more wavy than for the former owing to the fire-door being opened more frequently in firing, but, while this gives greater variations in temperature, at the end of the trip the average temperature was higher than in the former trip. The temperature at one time ranged between 800 and 900 degrees, reaching as high as 920 degrees.
3. Engine with 26 loaded cars:
   Average speed while running, 16 miles per hour.
   Average steam pressure, 127 lbs.
   Exhaust nozzles, 2 7/16 inches.
   Cylinders, 16 x 24 inches.
   Drivers, 5 feet.
   Total heating surface, 707 square feet.
   Average temperature in smoke-arch, 783 degrees.
   In this run the temperature ran frequently as high as 900 degrees, and at one time reached very nearly 1,000 degrees.
   Some other figures on freight engines were:
   Average temperature, 734 degrees. Maximum, 890 degrees.
   Average temperature, 739 degrees.
4. Passenger engine hauling 5 cars:
   Average speed, 33.1 miles per hour.
   Steam pressure, 123 lbs.
   Total heating surface, 694 square feet.
   Exhaust nozzles, 2 5/8 inches diameter.
   Cylinders, 14 x 22 inches.
   Average temperature in smoke-arch, 797 degrees.
   Highest temperature, 980 degrees.
5. Average temperature, 779 degrees. Highest, 920 degrees.
6. Average temperature, 713 degrees. Highest, 830 degrees.

My experience with the pyrometer in the smoke-arch of the above-mentioned return tubular boiler was that the average was up to those quoted, although I could not get such frequent readings on account of taking indicator notes on the same trip.

I was conversing a day or so ago with a man who is soon to astonish the mechanical world with a *new* invention calculated to revolutionize *everything*.

And now, O ye shades of the departed Professor Rankine, lay quiet in your resting place while this inventor proves "*by figures*, which, you know, don't lie," that he can use the fall of a certain amount of water from an elevated tank to pump a larger amount of water back into the same tank, and thereby make a most elegant irrigating appliance, whose action, you see, will be "perpetual."

I have forgotten the exact figures he gives, but the sum and substance of his argument is this: It has been determined that a man can pump a certain amount of water to a certain height in a given time. The tables accompanying the turbine circulars show that this water, falling from this height, will generate a certain horse-power; then it is known that one horse-power is equal to the combined power of so many men, and "substituting in the former equation," as the mathematical books say, we find that there is a surplus amount of power after deducting for friction, which power can be applied to pumping to the tank an extra amount of water for irrigating and other purposes. The originator says he knows this is contrary to philosophy, but he can only be convinced by experiments, which he is actually going to some expense in making.

What a good thing it is for Worthington that he got his Soudan contracts before this new "irrigator" made the land of El Mahdi blossom as the rose." PIERCE BUTLER.

A Screw Tool that May be Adjusted to Any Angle.

Editor American Machinist:

There is one point in Mr. Richards' essay on "Screw-Cutting on the Engine Lathe" which I should like to enlarge on. He says: "Few tool-posts have any arrangement for tipping the thread tool sidewise, and the inclination must be given by grinding."

I have attempted to supply this deficiency by a very simple expedient. Before forging the tool, I center the steel and turn off the corners, rounding the top and bottom. I find I can get any inclination of the tool desired in this way. G. CARPENTER.

Newark, N. J.

The Terms "Spoke" and "Arm."

Editor American Machinist:

I have just noticed in your issue of March 28, under the heading "Correct and Incorrect Mechanical Terms," a criticism on my use of the term "spokes." I wish to state that the occurrence of that word in connection with the sketch referred to by Mr. Marmon was the result of a blunder pure and simple, for which I hold myself responsible. From an etymological point of view, *spoke* is quite as good as *arm*—even better, I think—but I well understand that practice makes its use as a substitute for arm, as in the case referred to, neither common or proper. WM. F. M. GOSS.

Flux for Soldering.

Editor American Machinist:

One of your correspondents recommends the use of Star candle in soldering. I know this to be good, but I have had the most satisfaction in using, for all the softer metals—such as copper, lead, tin, and zinc—two parts rosin and one part lard, or three parts rosin and two parts tallow. This is very handy to use, and can be wiped off easily when through soldering.

WM. M. SENNETT.

Counterweight and Counterbalance.

BY M. A. BECK.

On this subject you doubtless have room for one more, so I send you a copy of some brown-paper sketches made several years ago, which show the action of counterweight with more or less clearness. The notes adjoining the sketches are as made on the originals, and may be convenient for reference.

Counterbalancing is a matter that can be attained with some degree of nicety only when pre-determined conditions are adhered to. Any change of load, speed, steam pressure, etc., especially in those automatic engines depending on a single valve for admission and exhaust, will produce disturbances which cannot be counteracted except by altering the weight of the reciprocating parts and counterbalance to harmonize with the effect of a greater or less admission and compression.

It is mainly by the action of the steam in the cylinder that the reciprocating parts of a high-speed engine can be properly counterbalanced. The work of counterbalancing is partly, through this elastic medium, transmitted to the frame or non-reciprocating parts, and must be counteracted in a meas-

ure by placing its equivalent in effect opposite the crank-pin. The cylinder and frame form the opposing element, on the one side, to the accelerating and retarding force necessary in effecting this balancing; and the requirement of a counterweight, for horizontal balancing, diminishes as the ratio of required accelerating force to the inert mass of frame, cylinder, etc.. is increased.

In all easy-running engines the tendency of the reciprocating parts and of the counterweight will be in the same direction while the crank is on and passing either center. At these points the counterweight can have no effect on the reciprocating parts, and hence its centrifugal effort, if sufficient to neutralize the initial accelerating force, would produce all that is needed. But we should none the less take into account the relation between the reciprocating and non-reciprocating masses of the entire engine. "Action and reaction are equal and opposite;" so, if we shoot a wedge between the cylinder head and the piston, as an equivalent in effect of the steam entering, the tendency of the wedge to shoot the reciprocating parts in one direction, and the cylinder, frame, etc., in the opposite direction, will be as the relative masses. At the initial point the horizontal movement of the reciprocating parts is opposed by the main bearing, but the tendency, with proper accelerating force, is there none the less, and (if repetition be allowed), the tendency of the counterweight being in the same direction, its effort should be just sufficient to neutralize the effort made by the frame to move in the direction opposite.

The recoiling effect of compression and admission in the engine is analogous to the action of a cannon. The greater the ratio between mass of shot and gun for any given velocity, the less the recoil; and the greater the ratio between the mass of reciprocating parts and non-reciprocating mass of engine, for any given speed, the less recoil, and therefore the need of a counterweight to pull in the opposite direction at the same time.

An engine of the Corliss type, with a simple unbalanced crank, and with cylinder and frame of sufficient weight to secure strength and stiffness, will run quite as steadily as an ordinary high-speed engine, with a crank disk balanced in the usual way, to secure good results. Not that balancing at high speed is so very difficult, but simply because it is difficult to get a builder to construct, or a customer to pay for, an engine with sufficient metal in the framing to secure the same ratio between the work of reciprocation and the inertia of the non-reciprocating mass in one case that there is in the other. So long as builders will insist on making light engines, and running them at high speeds, just so long will we have engines demanding the closest attention and the best of lubricants while they are making an effort to shake, even the unshakable.

In no case should the non-reciprocating mass (the shaft and wheel must be left out) be less than five times the initial accelerating force. Designed in this way, the weight and proportion of the engine will bear special reference to the speed it is intended to run at—the reciprocating mass, in case of high rotative speed, being fixed with reference to crank effort.

Ordinarily, we may make the frame, cylinder, etc., of mill engines of the Corliss type about fifteen times the weight of the reciprocating parts, and secure good results in running.

In counterbalancing, if we place a weight opposite the crank equal to the crank and pin + (the reciprocating mass multiplied by the initial accelerating force and divided by the non-reciprocating mass) good running will result, and the main bearing will be free from the abuse commonly received by over-balancing.

We are indebted to several correspondents, and to others who have called personally, for information we asked for as to who made rawhide gear wheels. We publish, on another page, one of the letters received, because it contains information as to the process by which such wheels may be made.

Development of the American Locomotive.

By Angus Sinclair.

EARLY LOCOMOTIVES AND TRACTION INCREASERS.

The locomotives invented for operating our first railroads were very small machines, scarcely heavier than the fire engine of to-day, yet they possessed all the elements that have made the modern locomotive successful.

Within ten years after the first American locomotive was built, increase of traffic called for heavier engines, but a change toward heavy machinery was not accomplished without a severe struggle. The six-wheel engine, with a four-wheel Jervis truck and one pair of drivers, had already become the recognized American locomotive, and many practical railroad mechanics and engineers believed that engine to be powerful enough for ordinary work. To increase the adhesion of six-wheel locomotives, traction-increasers were first invented at this time, and received extended application, but they could not stop the progress of increasing sizes, and the eight-wheel engine was brought out. That was for a time used for all kinds of trains, but the needs of the coal regions and mountain roads soon called for still heavier locomotives to handle the mineral traffic. Ross Winans, of the Baltimore & Ohio Railroad, took an active part in designing large freight engines. Some of his productions were wonderfully curious machines, but the railroad world did not adopt the camel-backs, the grass-hoppers, the crabs, and other types of locomotives worthy of the outlandish names they received from trainmen; so Winans, with all his mechanical ability, made little permanent impression upon American locomotives.

EARLY DOUBLE-HEADED LOCOMOTIVES.

Horatio Allen attempted, at an early day, to provide for the necessities of heavy railroad business by designing a double-ended locomotive, which resembled two engines fastened together without tenders. That form however met with no favor; and numerous other locomotive novelties, practical and impractical, were destined to early oblivion. Not till Alexander Mitchell, of the Lehigh Valley Railroad, designed his consolidation engine, in 1866, was there a recognized standard freight locomotive in America.

RECENT LINES OF LOCOMOTIVE IMPROVEMENT.

Of late years, the labors of locomotive designers and builders have been devoted principally to the work of developing the engine put into shape by the early inventors. Complaints are occasionally heard that no radical improvements have been effected on the engine since it first was applied to running railroad trains. This seems to be a compliment to the sagacity of early engineers, rather than a reflection on the ability of the present generation. If the work of modern locomotive builders and master mechanics does not rank high in the line of original invention, it possesses the merit of practical utility. They have changed the wood-burner to use coal as fuel, developed sizes, improved the proportion of parts, introduced material properly adapted for sustaining the strains and enduring the wear of hard service, and made the engine capable of transporting freight and passengers at low cost. This line of improvement is certain to make progress for years to come, but it is very unlikely that any radical change will be effected upon the locomotive while it remains a steam engine. The boiler may be made a little more efficient, and the distribution of steam in the cylinders may be improved for certain kinds of locomotives, but even in these lines there is smaller margin for improvement than is popularly supposed to be the case.

THE LOCOMOTIVE AN ECONOMICAL MOTOR.

The average locomotive compares favorably as an economical prime motor with the average stationary engine, and few engines use steam to better advantage than a first-class locomotive, well managed. In experiments recently carried out by Mr. Stroudley, locomotive superintendent of a prominent English railway, with a locomotive running an express train, he found the work was done with coal consumption of 2.03 pounds per horse-power per hour, which would be good work for a compound condensing engine. Good American locomotives are very much the same as good English engines, yet the engineering world persists in believing that a locomotive uses two or three times the quantity of fuel required by a stationary engine to do the same amount of work.

HEAVY WORK DONE BY LOCOMOTIVES.

Few men, even among engineers, realize the great amount of work done by a locomotive running a fast train. In keeping up the speed of an ordinary express train to a mile a minute, over a level track, a locomotive requires to develop over one thousand horse-power; yet, when people hear of a fireman shoveling a ton and a-half of coal an hour into the fire-box of an express locomotive, they conclude the engine to be very wasteful of fuel, when, in fact, she does the work very economically.

HIGH SPEED CAPABILITIES.

Some one may say the locomotives do not pull trains at the rate of 60 miles an hour; yet that speed is quite common on trains that are not regarded as fast. The assertion is often made that a new design of locomotive must be built to run trains at a sustained speed of 60 miles an hour. That is a mistake. There are few first-class roads in the country but have locomotives that could run a train they could handle 100 miles in 100 minutes, but it must not be necessary for them to pull up every few miles for a crossing or a sharp curve. It is not because the American locomotive is unequal to perform the mechanical work involved in running trains between our leading cities at a sustained speed of 60 miles an hour, that travel is not conducted at such a high velocity. The leading obstacle to fast traveling being maintained over long distances arises from the manner in which most of our railroads were built. The streets of cities and towns are traversed on the level, other railroads are nearly always crossed on the same grade, steep ridges are climbed to save cutting down, and sharp curves are introduced to avoid a little increase of first cost. No train can be run over a railroad of this description safely at unbroken high speed, and it is impossible to maintain a high average speed where frequent slowing down is necessary. Owing to the conditions peculiar to our railroad structures, requiring fast through trains frequently to reduce their speed and then regain the maximum velocity quickly, our locomotives labor at a great disadvantage in making a good economical record, for the power represented by the momentum of the train that gets dissipated by application of the brakes, has to be replaced from the boiler as often as speed has been checked. This has to be done under the disadvantage of working the engine hard to regain speed, which tears up the fire and wastes coal. But with all the drawbacks under which it is operated, few machines perform the work for which they were designed so efficiently as the American locomotive.

WHAT AMERICAN INVENTORS HAVE DONE FOR THE LOCOMOTIVE.

Let us review the work done by the American inventor and mechanic towards developing the locomotive. Take a standard eight-wheel engine, good for almost any kind of service. The high-pressure, high-speed engine itself, so simple and efficient, is the invention of Oliver Evans; the multi-tubular boiler, so essential to rapid steam making, and without which no train could have been kept running more than ten miles an hour, was invented by Nathan Read, an American. It is carried in compact form by four coupled driving wheels and a four-wheel truck, a combination patented in 1836 by Henry R. Campbell, of Philadelphia, the truck having been previously invented by John B. Jervis, of Rome, N. Y. The driving wheels, of cast iron made hollow, are the invention of Thomas Rogers, of Paterson, N. J., who was also among the first to use weights secured in the wheels to counterbalance the momentum of the reciprocating parts. Allen paper wheels—a thoroughly Yankee notion—carry the engine truck, and the tender is sustained by cast iron wheels with chilled tread, first invented by Ross Winans, of Baltimore. The single bar frame, holding cylinders placed horizontally and bolted together in the center, is another remarkably strong and compact combination, designed in part by Winans, but put in its present shape by William Mason, of Taunton, Mass. All the pipes and joint connections are secured against leakage by the ground joint, invented by M. W. Baldwin, of Philadelphia. This water pump gets a steady action and is secured from breakage by the air chamber invented by Walter McQueen of Schenectady. Expansion braces, first brought out by Rogers, give the fire-box a secure hold on the frame, yet permit the boiler to lengthen or shorten, as change of temperature requires. The weight of the engine is distributed evenly to the axle-boxes by means of equalizing levers, invented in 1837 by Joseph Harrison, of Philadelphia. Two fixed eccentrics, invented by William T. James, of New York, give movement to an Allen slide valve, balanced by a Richardson device. Spark-throwing is restrained by an extended smoke-box combination, invented by John Thompson of the Boston & Maine Railroad. Combustion is admirably promoted and smoke-making prevented by the Buchanan design of fire-box, which is constructed of mild steel, first made successful for that purpose by the Baldwin Locomotive Works. The engineer and fireman sit comfortably in a convenient cab, first applied by David Matthew, but since improved by every builder in the country. As the locomotive thunders along through the blackness of midnight over giddy chasms spanned by traceries of steel, over the dangerous grades of mountain scenery or through the sameness of western plains, the engineer sits calm and steadfast, secure in the knowledge that engine and train are perfectly under his command. This entire confidence is begotten of the knowledge that a turn of his hand would grasp every wheel in the train between vise-like brake-shoes, applied by that greatest life-saver of modern times, the Westinghouse automatic air brake, one of the most valuable parts that the American inventor has added to railroad machinery.

A grooved fly-wheel of remarkable size and weight is in course of manufacture by Messrs. Goodfellow & Matthews, of Hyde. The diameter is 34 feet, and the weight 83 tons, while the circumferential velocity will be 5,350 feet, or over a mile a minute. The face is grooved for thirty-two ropes, each $1\frac{3}{4}$ inch in diameter, and capable of driving 40 horse-power. The fly-wheel is intended for the factory of the Astley Mills Company, near Hyde Junction, and is made in fifty pieces. It comprises two sections, each of which has a boss, twelve arms, and twelve segments. The segments are joined together by eight bolts $1\frac{1}{2}$ inch in diameter, and are each attached by four bolts, $2\frac{1}{2}$ inches in diameter, to the arms. The bosses each weigh eight tons, and are keyed to the shaft by four keys 7 inches wide. The ropes will transmit an aggregate of 1,280 horse-power.—*Hardware Trade Journal.*

The Porter Locomotive Works, at Pittsburgh, recently wrote, for the benefit of the Western Railway Club, some notes of the material used in their works for the construction of locomotives. They consider steel best adapted for piston rods, because it has no fiber, lasts well, is not easily corroded, and is not high in price. For cross-heads and rocker arms they use cast-iron. They had tried steel castings for cross-heads, and found them stronger than iron, but they cost more and did not wear so well. Wrought iron had been used to some extent for rocker arms, but they did not think it wore evenly, and they believed in having the rocker arm weak enough to break in case of accident rather than the link. They cast their piston-heads, and two grooves are cut in the head, into which the rings of cast-iron are sprung. They bore the hole for the piston-rod taper, and rivet the end, which they regard as preferable to a nut.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

HORACE B. MILLER, Pres't.

JACKSON BAILEY, Vice-Pres't.

LYCURGUS B. MOORE, Treas. and Sec'y.

96 Fulton Street, New York.

JACKSON BAILEY, Editor. HORACE B. MILLER, Business Manager.

F. F. HEMENWAY, ANGUS SINCLAIR, } Mechanical Engineers.

The American News Company,

Publishers' Agents, New York.

The International News Company,

11 BOUVERIE STREET (Fleet Street), LONDON, ENG., will receive subscriptions for the AMERICAN MACHINIST, at 14/7 per annum, postage paid.

DEALERS SUPPLIED BY

The American News Company, New York.
The American News Company, Denver, Col.
The American News Company, Kansas City, Mo.
The American News Company, Omaha, Neb.
The American News Company, St. Paul, Minn.
The New York News Company, New York.
The National News Company, New York.
The New England News Company, Boston, Mass.
The Central News Company, Philadelphia, Pa.
The Western News Company, Chicago, Ill.
The St Louis News Company, St. Louis, Mo.
The Cincinnati News Company, Cincinnati, O.
The Detroit News Company, Detroit, Mich.
The Pittsburgh News Company, Pittsburgh, Pa.
The Baltimore News Company, Baltimore, Md.
The Rhode Island News Company, Providence, R.I.
The San Francisco News Co., San Francisco, Cal.
The Brooklyn News Company, Brooklyn, N. Y.
The Williamsburg News Co., Brooklyn, E. D., N. Y.
The Newark News Company, Newark, N. J.
The Northern News Company, Troy, N. Y.
The Albany News Company, Albany, N. Y.
The Washington News Company, Washington, D.C.
The New Orleans News Company, New Orleans, La.
The Montreal News Company, Montreal, Canada.
The Toronto News Co., Toronto, Ontario, Canada.
The Toronto News Co., Clifton Branch, Clifton, Ontario, Canada.

SUBSCRIPTION.

$2.50 a year in advance, postage prepaid in the United States and Canada.

$3.50 a year to Foreign Countries, postage prepaid, except Bolivia and South Africa, to which the subscription rate is $4.50 a year, postage prepaid.

ADVERTISING.

Transient, 35c. per line, each insertion.
"Business Specials," 50c. a line.

EDITORIAL ANNOUNCEMENTS.

☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those especially interested in the occupations we reprsent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, APRIL 18, 1885.

CONTENTS.

	PAGE
New 15-Inch-Pillar Shaper	1
Lathe for Facing Flanges of Columns and Pipe.	1
Grinding and Using Cutting Tools. By James F. Hobart	1
Automatic Railway Cutting-Off Saw	2
Milling Taper Work. By Fred J. Miller	3
The Soudan Railroad	4
An English Engineer on American Machinery	4
A Silver Piston Gland	4
Automatic Knife Grinder	4
Condition Contrasts in New York	4
Whitney's Combined Ratchet Drill Stock	5
New Chucking Lathe	5
Work in the Bement Shops	5
Letters from Practical Men—Making and Using Rawhide Wheels—Curious Electrical Disturbance—Locomotive Draft Pipes—Making Black Lines on White Paper—Curious Air-Brake Trouble. A Question in Mechanics—Smoke-Box Temperature of Locomotives. A New Perpetual Motion Scheme—A Screw Tool that may be Adjusted to Any Angle—The Terms "Spoke" and "Arm"—Flux for Soldering	5, 6
Counterweight and Counterbalance. By M. A. Beck	6
Development of the American Locomotive. By Angus Sinclair	7 8
Prospects of Machinists	8
Struggle to Maintain the Prison Contract System	8
Traction Increaser	8
Dangers to Women Among Machinery	9
Literary Notes	9
Questions and Answers	9
Manufactures	9
Machinists' Supplies and Iron	10

Prospects of Machinists.

We have recently met with several cases where young men have raised objection to learning the machinist trade, because wages are so low and work so depressed in the business, that they were led to believe the trade offered no prospect for obtaining a respectable livelihood. There is certainly too much truth in the assertion that work is scarce and wages low in the machine trade, but the business is, unfortunately, merely representative of the existing condition of other trades. Where a young man is ready to go to work acquiring the skill that will after a few years enable him to gain a livelihood working at a trade, there are better prospects for machinists than for any class of artisans we are acquainted with. This season of depression will pass away, and the return of prosperity will be felt as rapidly in machine shops as in any line of industrial operations. We regret of observe that there is a disposition among the youth of America to shun the shop and look to the store or office for occupation. If the young men, who allow the feeble sentiment they call ambition to turn in this direction, understood properly where it leads, there would be fewer applications for clerkships and more for employment in workshops. Every line of light employment is chronically overcrowded, and during the very best times there are many clerks idle in every city throughout the United States. Work of the kind suitable for women, has nearly always sufficient recruits from the weaker sex without requiring the addition of men, and where men are employed in competition with women the pay is certain to be low, no matter how important the duties performed may be. At present, thousands of clerks are destitute in New York city, and many of them, driven by want, are ready to work at any sort of employment that will yield a livelihood. The ranks of day laborers is being daily swelled by destitute clerks who can obtain no higher kind of manual labor for want of the requisite skill. In times of commercial depression the struggle that ends in the survival of the fittest or the suppression of the weakest goes fiercely on in all departments of labor, but in the line of genteel labor only is manhood vanquished.

The first requisite towards contributing to success in the machinist trade, as in any other, in fact, is to learn the business thoroughly. We recently received a letter from a young man saying he was a sort of a machinist and asking for aid in obtaining other employment. There are too many "sort of machinists" round, whom no machine shop proprietor can afford to employ, and these are the men who howl loudest about the trade offering no prospects for an enterprising man. If a young man has not the perseverance and energy that will lead him to acquire skill in the use of all the tools of his trade, he had better not begin an apprenticeship. If, on the other hand, he enters the trade and becomes a skillful manual machinist, he is certain to obtain a good livelihood, but if his ambition soars above the lathe and vise-bench, he must reach out into an acquaintance with the scientific principles of his business. One of the best lathe hands we ever knew, was not respectably acquainted with anything away from the lathe, but there he was a master. A man of this kind cannot rise to be foreman or superintendent, yet a machinist who is skillful beyond his fellows generally considers he has the right to supervise work when a man has to be selected for that purpose. There are two kinds of what may be termed high-skill men found in machine shops. One has a natural aptitude for handicrafts and repeating operations soon develops surprising skill in his hands, but his head takes no conspicuous part in facilitating work. Another man is naturally ingenious, but does not acquire manipulative skill readily, yet he becomes a fair workman, and always finds out the why and wherefore about the action of any machine he may be called to work upon. This man generally contrives to learn the simpler geometrical problems that relate directly to the machine shop, and his knowledge recommends him as the proper man to select for promotion.

Locomotives for the Soudan railway are being constructed by a machinery-making firm at Leeds, in England. The engines are of two classes. One class rest on four wheels coupled; the other on six wheels coupled. A four-wheel engine will be a very unsteady machine for running on a roughly-constructed railroad. The locomotives will be shielded with boiler-plate covering to protect the engine-men from the rifle balls of hostile Arabs, and the motion will be protected from sand by a canvas covering. The most important essential omitted about the outfit is heat-proof men to handle the engines.

Struggle to Maintain the Prison Contract System.

A struggle is now in progress in two or three State legislatures represented by the laboring and manufacturing interests on one hand, and a ring of wealthy prison contractors on the other. A year ago last fall the people of the State of New York decided, by an overwhelming majority of ballots, that the prison contract system ought to be abolished. But the vote was only an expression of popular will, the force of law being purposely left out of the contest. At the same time a legislature was elected, having a majority susceptible to the influence of the contractors. The consequence was that no provision was made to carry out the people's will, and the legislature elected last fall (which is now in session and discussing the problem) seems to be predominated by the same influence. Action has been prevented upon this important question for eight or ten years by the subterfuge of appointing a legislative committee to inquire into the best methods of employing prisoners, during the interval of legislative sessions, and preparing a report to present to the next session. Of course, it was never intended by the friends of the wealthy contractors to act upon any of these reports. The committee formed a convenient excuse for deferring the expressed will of the citizens of the State and keeping up the lucrative contracts to the injury of free productive industry. Representatives of the contract ring, both in and out of legislative halls are still endeavoring to keep up the dodge of appointing committees of inquiry so as to renew the valuable contracts for five years each. As they are likely to fail in this, they propose the "piece price" plan for jobbing out the labor of prisoners to contractors instead of the day's work plan now followed. Such a change would work but little if any real reform. The State should employ its own convicts in occupations that will not injure free industries. In the northern part of the State of New York is a railroad, some twenty-five miles of which were built successfully by the convicts of the Dannemora prison. The road was the property of the State, but it was given to a noted politician for "one dollar in hand paid." It is now owned and operated by a mining company, of which the said politician is one of the chief officers. This was before the era of the private contract system. After that system became established the State wished to have a plank road from the prison to a village about thirty miles distant. Instead of employing the convicts to build the road the contract was given to the mining company above mentioned.

It is not difficult to devise suitable ways to employ prisoners on State account. The disposition to so employ them is all that is lacking.

The secretary of the American Society of Mechanical Engineers announces by circular that at the next meeting of the society a paper will be presented on the Finance of Lubrication. Members are requested to present any memoranda which they may have on the general topic. While many of the members have had valuable experience in this direction, we are confident that one individual who is not a member knows more about the finance of lubrication than could be gathered from all the books ever published on oils, greases, and other slippery things. His name is John Fink. We are unable to say just where he can be found, but can assure the officers of the society, in case they should consider the propriety of extending him an invitation to attend the meeting and relate his experience, that several of the members are particularly desirous of seeing him.

Traction Increasers.

It is surprising how persistently devices for giving temporary increase of adhesion to locomotives have been urged upon the railroad mechanical world as valuable inventions. As early as 1834 E. L. Miller, of Charleston, S. C., who helped to design the first locomotive built in America for regular service, invented a traction increaser, which transferred part of the tender weight to the drivers, and it was subsequently adopted by Mr. Baldwin. At that time six-wheel locomotives were considered the proper size, and as traffic increased, calling for more powerful engines, the traction increaser was considered the proper way of giving increased adhesion. But the admiration of zealous and influential friends in that early day was powerless to make traction increasers popular. When the railroad world decided in the most practical way that the Miller traction increaser was not wanted, the device was permitted to slumber in peace for several years. After it had enjoyed, like Rip Van Winkle, about twenty years of sweet repose, the traction increaser awoke again, but unlike the hero of the Catskills, it had become young again. In fact, a whole family of new devices have followed the rejuvenation of the first attempt in this direction, but none of them seem destined to meet with success in the world equal to their original progenitor although its career was short and inglorious.

A traction or rather adhesion increaser is a mistake intended to correct a mistake. It is an attempt to compensate for blunders in designing a locomotive. If an engine has not sufficient adhesion to keep the power transmitted from the cylinders from slipping the wheels under any but extraordinary conditions, the designer of the engine is to blame, and no traps meant to throw part of the tender's weight upon the engine frame will act satisfactorily. So far as mechanical ingenuity could be employed in correcting a vicious design, the appliances for increasing adhesion fitted upon the single coupled high-speed locomotive, built by Baldwin's people some years ago for the Bound Brook route, would have been successful were success in that line possible, but they did not prevent that engine from being a failure. Several patent traction increasers are now being urgently pressed upon railroad superintendents and master mechanics, but our advice is to keep clear of them. Taking the weight off the front of the tender is by no means a safe practice, and the steam connections used to transfer the weight are a constant source of trouble.

British newspapers are raising an outcry against the purchase of steam pumps for the Suakim-Berber pipe line from the United States. The *Ironmonger* says it has excited a "good deal of interest and indignation" in manufacturing circles. They have suddenly been converted to the policy of Government protection to home industry, or else desire to waive for this occasion the free-trade notion of buying wherever the best advantages are afforded. We sympathize with the English manufacturers in their disappointment. One reason for sending the pump order to New York was to obtain the pumps promptly, so that the pipe line could soon be set working. According to late advices from the scene of British military operations in the Soudan, it does not look as though the pumps will be needed for several months to come. General Osman Digna is in possession of the territory where the pumping is to be done, and he is in no hurry to leave. On the contrary, he is making it very unpleasant for the pioneers, who are trying to open the

way for the railroad and pipe line. If the pumps are placed in position too soon, they may be broken up by the hostile forces. In that event, it will be necessary to have them promptly replaced, and orders for more American pumps will be the result.

Dangers to Women Among Machinery.

There is always more or less danger of having women working among machinery from the liablility of their loose clothing to get caught by a gear wheel or other revolving part, so that the wearer gets dragged into the machinery. A new source of danger in the employment of women among machines has lately been shown in the Charleston Bagging Factory. A young woman, named Begley, who was attending a machine in that establishment, was noted for having a magnificent head of hair, which, woman like, she was not disposed to hide under a bushel or within the cover of a cap. About a month ago her hair became entangled in a revolving spindle and the machine tore off her entire scalp, including her eyebrows and right ear. The girl has exhibited wonderful endurance, and it is expected she will recover. The case has been noted with deep interest by the medical profession in Charleston, and the result is awaited with interest by the profession elsewhere. The physician in charge says that his patient has passed through the first crisis, and he entertains strong hopes of her recovery.

An engineer of the dummy locomotives that pulls trains through the streets of New York appears to occupy a curious position in the eyes of the guardians of our laws. The man is boxed up in a covered engine, where he can see little of what is going on except ahead, yet the law persists in holding him responsible for what is going on in the cars his engine is pulling, even though the greater part of the train is beyond the view of the engineer. One afternoon lately, one of these homely engines was crawling along at a walking pace, with a train of cars behind it, and a pedestrian, impatient to cross the street, climbed on to a car to pass over, but fell before the wheels and was killed. The man did not consult the engineer about the danger of the feat he undertook to perform, and the evidence indicated that the train was moving very slowly, yet the engineer was promptly arrested and incarcerated in a prison cell. We certainly think this is a case of inflicting disgrace upon an innocent man, but the law's minions of New York have no tenderness for any citizens except ruffians steeped in crime.

Exhibitors of steam engines at New Orleans are furnished with room for the usual complaint of wet steam and improper facilities for connecting their engines. We understand that the cylinder of the large Harris-Corliss engine, on exhibition there, has been twice cracked from these causes.

The applications for space in the machinery department of the International Exhibition at Antwerp have been so numerous, that the space originally set aside for this section will be increased. Germany alone has 900 exhibitors. The gallery of machinery in motion will be made larger, and is likely to be very interesting.

Literary Notes.

The *Ironmonger* for March, 1885, is the third issue of a new monthly journal devoted to the hardware, stove and iron interests, and edited by F. B. DeBerard. We have watched the progress of this publication with some interest, as it is conducted upon a plan which is somewhat of a novelty in trade journalism. While not slighting the more practical departments of trade news, the new paper proposes to devote special attention to trade and personal gossip, enlivened by numerous sketchy portraits and caricatures. It is very tastefully gotten up, and promises to be healthy, witty and prosperous. It is published by the Ironmonger Company, 419 Broadway, New York, and 150 Dearborn st., Chicago. Subscription price, $1 a year.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(122) R. K., Columbia, S. C., writes: I recently tested a boiler to 115 pounds hydrostatic pressure, and was told that it was equal to 150 lbs. steam pressure. 1. Is it true? *A.*—There is a difference of opinion as to the effect of hydrostatic pressure on a boiler. Of course 115 lbs pressure is no more nor less than that, whether it is water or steam pressure, but, as generally applied, by a pump, there is reason for believing that it may strain a boiler a little worse than the same pressure of steam. 2. Would burning leather scraps in the furnace injure a boiler? *A.*—We fail to see that it would.

(123) A. L., Malden, Mass., asks: Can you tell me of a good cement for leather that will stand moisture: also for rubber? *A.*—A cement for leather, that is said to be waterproof, is made by dissolving gutta-percha in bisulphide of carbon until it is about as thick as molasses. The parts to be united are covered with this and placed under pressure until united. A cement recommended for rubber is made by melting together 16 parts gutta-percha, 14 parts India-rubber, 2 parts caulkers' pitch, and 1 part linseed oil. To be used hot.

(124) T. C. B., Dedham, Mass., asks: What will clean burnt oil from the cylinder head of an engine, and is there anything better than paraffine to keep finished work bright? *A.*—Strong lye water is good for cleaning the cylinder head. If a horizontal engine, take off the head and lay it down where you can cover it over night with waste saturated with the lye water. Use a small package of the lye to a pail of water. The paraffine is probably as good as anything for finished work.

(125) E. M. O., Wilmington, Del., says: 1. What is the advantage of inside lap on a locomotive valve? *A.*—It delays release, and so increases the period of steam expansion. 2. Is a relief valve on a steam chest of a locomotive of as much benefit where an extended stack and high exhaust pipe are used, as with a diamond stack and low exhaust nozzles? *A.*—No. 3. What percentage of a locomotive power does it take to move her? *A.*—About 10 per cent., on a level track.

(126) J. I., Rock Spring, Wyoming, Ter., writes: I have an engine cylinder 1⅞"x3", and another 2½"x3". Can I connect them so as to run them compounded, and both high-pressure, at will, and how shall I connect the exhaust from high-pressure to low-pressure cylinder? *A.*—Connect your exhaust from high to low-pressure with ordinary steam pipe, with cocks so you can turn it into the atmosphere when you want to, and make a branch in the steam pipe so that you can take steam direct to low-pressure steam chest when desired.

(127) T. R. Jamestown, N. Y., writes: A belt runs from a 15' to a 50" pulley, pulleys 30' apart. Upon which pulley will it slip, and why? *A.*—It cannot be told with certainty upon which pulley the belt will slip, but the probability is, upon the large pulley The reason is that the pressure per square inch of contact is increased as the diameter is decreased, and the increased friction more than compensates for the greater surface of the large pulley.

(128) J. H. S., Hanover, Pa., writes: Will you give me a plan to find whether a locomotive crankpin is bent or not, with wheels under the engine? *A.*—In the absence of special tools for that purpose, the crankpins can be tested by disconnecting the side rod from one pin, keying up the connected end as close as possible and pinching the engine. A mark must be made to locate the line the disconnected end should follow if the crankpin is true. When the engine has been moved to four or five different positions, and it is found the end of the rod has not deviated from the straight line, the pin must be all right. The other pins can be tested in the same way.

(129) W. A. K., Dartford, Ont., writes: I have a boiler in a boat. The boiler is made of steel, and is 17" diameter and 3' long. Shell is made of one steel plate 3-16" thick, single-riveted; heads same thickness as shell; crown sheet well braced. The boiler is nearly new, no scale. 1. What is a safe working pressure? *A.*—Assuming the tensile strength of the steel to be 60,000 lbs., the shell should be safe at 150 lbs. pressure. The heads are light, but if securely held by tubes and braces, they may hold. We should advise that you have the boiler thoroughly tested at one-third higher pressure than you propose to carry. 2. An old engineer tells me that the crank of a steam engine passes one dead center quicker than it does the other. Is this true? *A.*—The crank of a steam engine moves at different velocities when near the two dead centers, owing to the angularity of the connecting-rod.

(130) W. A. C., Columbus, Ga., asks: 1. Is there a book published which, by studying, one can learn the principles of screw cutting on the engine lathe? *A.*—Full information on this subject is given in articles contributed to the AMERICAN MACHINIST by Frank H. Richards. The articles are in the numbers of August 13 and 20, and October 15, 1881, and April 4, 1885. 2. What is the formula used to ascertain the tractive power of a locomotive? *A.*—See article on the subject in AMERICAN MACHINIST, August 16, 1884.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Curtis Pressure Regulator and St'm Trap. Mar. 21, p 14

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Tools for amateur and foot-power lathes. Send for illustrations. Hartford Tool Co., Hartford, Ct.

The Young Engineer's Own Book, $3. Edw. Meeks, Publisher, 1002 Walnut St., Phila., Pa.

For Sale—26" b. g. drill presses, quick ret'n bal. spindles, new, modern tools, $150. S. M. York, Clev'd, O.

10,000 Kellam's Steam Damper Regulators in use is a guarantee of their value. See cut, page 12.

Light fine interchangeable mach'y to order. Foot lathe catalogue for stamp. E. O. Chase, Newark, N. J.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Universal grinders for lathe-centers, chucks, angles, or cylinders. C. C. Hill, 84 Market st., Chicago, Ill

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Cooper, On the Use of Belting, $3.50. Edw. Meeks, Publisher, 1002 Walnut St., Phila., Pa.

Engineers, send for sample of Eureka Packing. It will please you. Hine & Robertson, 12 Cortlandt Street, N. Y. City.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

A few chucks, of all kinds, for sale at half price. Slightly damaged. Send for list to the maker, A. F. Cushman, Hartford, Conn.

The outline ("wax process") engravings shown in the AM. MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large: prices low. Frasse & Co., 62 Chatham St., N. Y.

Farley's Reference Directory of the Machinists, Iron, Steel, and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-Taught," $4. Books for workmen Joshua Rose, Box 3306, New York City.

Locomotive Engine Running and Management. By Angus Sinclair. Price $2, An excellent book for men interested in steam engineering, valve setting, designing valve motion, the care of the Westinghouse brake, etc. Published by John Wiley & Sons, 15 Astor Place, N. Y.

Every young man who aspires to be either a mechanic, merchant, or manufacturer, owes it to himself that he become thoroughly familiar with the writings of Chordal. John Wiley & Sons, 15 Astor Place, N. Y., have issued a new and enlarged 12 mo. edition of "Extracts from Chordal's Letters." Handsomely bound in cloth, with over 50 illustrations. Price, $2. Discount of 25 per cent. on orders for five or more copies.

MANUFACTURES.

Wm. Fink, Westminster, Md., will build a machine shop.

The Tully (N. Y.) Wagon Works will erect a new factory.

John W. Snow, Birmingham, Ala., will build a carriage factory.

J. M. Scott, West Point, Ga., will build plow works.

Truxal & Dunmeyer, Chattanooga, Tenn., will probably erect a large machine shop in the spring.

F. S. & G. L. Brown, Baltimore, Md., will spend about $8,000 in fitting up a new machine shop.

A cotton seed mill has been established at Meridian, Miss., with $50,000 capital.

Cowan Van Horn, of Maryville, Tenn., intends to erect machine shops at that place shortly.

G. M. Setzer, Troutman's, N. Carolina, will build a new handle factory, at a cost of $30,000.

Wm. H. Ford, Lynchburg, Va., has commenced the erection of machine shops.

D. M. Coffin, of Homer, Ill, will probably build a $30,000 flour mill in Corsicana, Texas.

The Michigan Stove Company, of Detroit, will build a $30,000 addition.

The Killmer Wire Works, of Schenectady, will remove to Keysville, N. Y.

Potts & Co., Bridgeport, Pa., lubricating oil manufacturers, are about to put in more machinery.

Gravely & McCabe, founders and machinists, Martinsville, Va., expect to enlarge their works this spring.

Water works will soon be constructed at Muncie Ind., at a cost of $50,000. Boilers and pumps will be wanted.

The Ellicott Company, Limited, has been formed in Baltimore, to do a general machine business. Capital, $7,500.

The Gerst Bros. Manufacturing Company, St. Louis, Mo., have completed their new office and foundry building.

A. Fleugle, Ten Eyck St., near Leonard, Brooklyn, N. Y., will erect a new factory in May, for the manufacture of iron railing.

Boyts, Porter & Company, Connellsville, Pa., will build a new foundry and fit up a machine shop with new tools.

The Scranton Manufacturing Company, Chicago, will soon enlarge their manufacturing facilities and add new machinery.

The J. I. Case Plow Company, of Racine, will hereafter be known as the J. I. Case Plow Works, Mr. Case being the sole owner.

The Davidson Steam Pump Company have opened a branch office in Boston, at 51 Oliver Street, in charge of L. C. Lanphear as manager.

R. L. Cobb & Company, Little Rock, Ark., manufacturers of engines, etc., contemplate the erection of an addition to their plant.

Bakenhus & Muesler, 95 East Indiana Street, Chicago, are building a 95x50 foot wagon factory. It will be ready to run about the middle of May.

Newmarket, N. H., has voted to exempt from taxation for ten years any manufacturing industry that may be established with a capital of $10,000.

The U. S. Rolling Stock Company, Hegewisch near Chicago, are again at work upon their new building. Additional machinery will be put in.

The Eddy Valve Company, Waterford, N. Y, have issued a new illustrated catalogue and price-list of valves and hydrants. They make a variety of sizes.

The Woodstock (Shenandoah County, Va.) Foundry and Machine Shops will, says the *Virginian*, be reopened soon, under the management and control of Mr. John Halliday, a practical workman.

The Pittsburgh & Western Railroad contemplate building a new repair shop at Allegheny City the coming summer. Wm. Flahaven, master mechanic, Allegheny, Pa.

The Co-operative Hat Shops at South Norwalk, Conn., are doing a good business. It is probable that the strike will soon be settled, as most of the operatives are at work.

The Huston Spring Wagon Company, Columbus, Ohio, recently burned out, have received several offers to rebuild elsewhere. They are considering the offers.

Hereafter the Zell safety boilers will be built by the Pioneer Iron Works, exclusively for the Safety Steam Generator Company, 68 Warren Street, New York, who will make a specialty of this boiler and boiler attachments.

The Kemble Iron Company, of Pittsburgh and Riddlesburgh, Pa., has been formed to manufacture pig iron. Capital, $100,000. Mr. Singer, of the firm of Singer, Nimick & Co., of Pittsburgh, Pa., is one of the corporators.

The Western Nail Company, of Belleville, Ill., have decided to increase their capital stock from $50,000 to $200,000, their object being to increase the capacity of works and also to engage in the manufacture of steel nails.

The Southern Machine Company, Shelbyville, Tenn., have raised nearly all the capital required to establish foundry and machine shop. They contemplate purchasing works now located in another town, and removing them to Shelbyville.—*Baltimore Manufacturers' Record.*

The Rochester (N. Y.) Machine Tool Company has just completed for the Ball Engine Company a a 30"x30"x8' planer, which has an original device, worked from either side, for stopping instantly without interfering with the countershaft. It saves time where there is much changing of tools, and is valuable in permitting quick stoppage to avoid accident.

The Holyoke paper trade has taken a decided boom. All the paper mills in Holyoke and vicinity are running on full time, and orders are coming in at many of them which compel them to draw from reserve supplies. This revival in business is felt more especially among the mills where fine papers are manufactured. Holyoke sends out a small army of drummers, and the general expression from them is, that all over the country the paper trade is rapidly picking up. Prices are down, but remain firm. One leading manufacturer says that never in the history of stationery has there been such a demand for elegant and fine papers as at present. Cheap papers are a drug.—*Boston Commercial Bulletin.*

Machinists' Supplies and Iron.

New York, April 2, 1885.

The anticipated improvement in the supply trade does not materialize to a conspicuous extent. Business drags along in a perfunctory sort of way, and dealers complain that the traces of improvement are so minute that they cannot see them. Yet a fair volume of business is being transacted, but prices are kept very low.

There is slight improvement noticeable in the demand for plate and tank iron. Structural iron is also in greater demand than it has been lately, and prices have a buoyant tendency.

Iron—The market for standard brands of pig has ruled steady during the week, but there is a disposition shown to shade down prices of inferior brands. The volume of business does not increase much. We quote Standard Lehigh brands $18 to $18.50, for No. 1 X Foundry at tidewater; $17 to $17.50 for No. 2 X Foundry, and $14.50 to $15.50 for Grey Forge at furnace.

Scotch pig continues in the depressed condition indicated from week to week for several months. Some of our Southern iron is coming to be substituted for Scotch pig, and tends to keep the market depressed. We quote Shotts, $21.50 to $21.75 to arrive; Coltness, $21.50 to $21.75 to arrive; Glengarnock, $19 to $19.50 to arrive; Gartsherrie, $20.50; Summerlee, $20.50; Carnbroe, $19 to arrive; Eglinton, $18.50; Langloan, $21; Dalmellington, $19.

Copper—The demand for ingot continues light and prices depressed. Lake has sold at 10¼ to 10⅜ cents; Baltimore and other brands, 10 to 10¼ cts.

Lead—The market for common pig has been dull, and a break in prices was made early in the week by one firm, but others did not follow, and prices now remain as when last reported, viz, 3.70 to 3.75 cents.

Tin—The market for ingot has ruled firm, with prices tending upward. For jobbing lots Banca is quoted at 18¼ to 18¼ cents; Straits and Malacca, 17.70 to 17.80 cents.

✻WANTED✻

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Position wanted—supt. or chief draftsman. Address J. C. S., Am. Machinist.

Situation by first-class patternmaker accustomed to make working drawings. T. C., Am. Machinist.

Wanted—Position as traveling salesman for some firm manufacturing specialties. Address Salesman, Am. Machinist.

Wanted—foreman boilermaker—a man with thorough knowledge of boiler and sheet-iron work—to take charge of a large boiler shop. Address F. M. C., Am. Machinist.

Wanted—foreman for iron foundry in western Penna., making heavy machinery castings, etc. None but thoroughly competent men, of good habits, need apply. State experience, age and present employment. Address L. L., Am. Machinist.

Experienced mech. draftsman, with best references from present and former employers, is looking for a situation; would prefer printing press work, and like to go West. P. O. Box, 863, Woonsocket, R. I.

Wanted, on a salary, as salesman and sole general representative upon the road of a well known manufactory, a gentleman of good address, tact and business ability. Must be thoroughly acquainted with machinery, and well grounded in mechanical principles. Unexceptionable references will be required. Address "Carpenter," P O. Box 773, N.Y.

To active, enterprising men agencies will be given for Kellam's Steam Damper and Pressure Regulators in New Haven, Hartford, Providence, Poughkeepsie, Albany, Syracuse, Rochester, Oswego, Buffalo, Pittsburgh, Titusville, St. Louis, Richmond, Charleston, Savannah, Mobile, New Orleans. For particulars, address Hine & Robertson, 12 Cortlandt Street, N. Y.

For Sale at a Bargain—Bement screw planer to plane 34"x36"x12'. Good condition. $500 cash f. o. b. Balto. Detrick & Harvey, Baltimore, Md.

STEPHENS' PATENT VISES.

50 Per Cent. of time and labor saved by using this solid, strong, durable, quick-working Vise. Has the improved taper, pipe and other attachments. Sold by the trade. Send for circular.

MELVIN STEPHENS, Prop'r, Office, 41 Dey St., New York.

Iron Planers and Shapers.

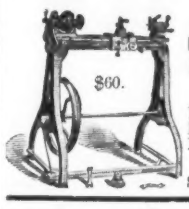
SUPERIOR DESIGN AND WORKMANSHIP.

ROCHESTER MACHINE TOOL WORKS, Lim.

ROCHESTER, N. Y.

CHANDLER & FARQUHAR,

168 Devonshire Street,



BOSTON, MASS.

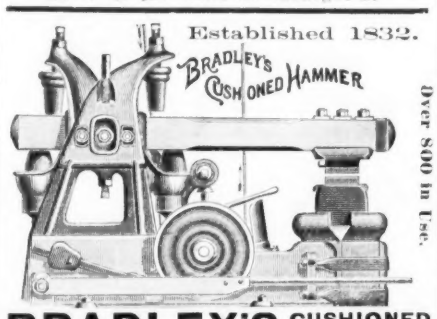
TOOLS AND SUPPLIES

FOR

Machinists, Plumbers, Gas Fitters, Electricians, Model Makers, Roller Skate Makers, Amateurs, Etc.

Send for Catalogue B.

Established 1832.



Over 800 in Use.

BRADLEY'S CUSHIONED HAMMER.

Stands to-day without an Equal.

It approaches nearer the action of the Smith's Arm than any Hammer in the WORLD.

SPECIAL NOTICE.

All parties making, selling or using an Upright or Helve Power Hammer having a Cushioned Vibrating Saddle, infringe our patents, and we shall hold them legally liable for the same.

BRADLEY & COMPANY, Syracuse, N. Y.

H.W.JOHNS' ASBESTOS PACKING.

Our improved elastic Asbestos Piston Rod Packing is made from the best quality of pure Asbestos fiber and is the most perfect, compact, and durable Packing ever produced for locomotive, marine, and other engines.

Asbestos Wick Packing,
Asbestos Mill Board and Sheathing,
Asbestos Gaskets and Rings,
Asbestos and Rubber Tape and Cloth.

Asbestos Boiler Coverings.

Our Asbestos Cement Felting is the most effective and durable Non-conducting covering for Steam Pipes, Boilers, Stills, and other Steam-Heated Surfaces.

Asbestos Hot Blast Cement Felting,
Asbestos Air Chamber Covering,
Asbestos Locomotive Lagging,
Asbestos and Hair Woven Felt,

ASBESTOS ROOFING.

Asbestos Building Felt.

Asbestos Cloths, Cord, Twine, Yarn, and Sewing Twine, Asbestos Gasket and Retort Cements, etc.

LIQUID PAINTS, and PURE COLORS.

DESCRIPTIVE PRICE LIST AND SAMPLES FREE.

H. W. JOHNS M'F'G CO.,

Sole Manufacturers.

87 Malden Lane, New York.

175 Randolph St., Chicago. 170 N. 4th St., Philadelphia. Billiter House, London.

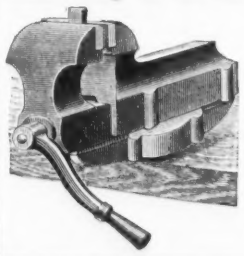
NEW UNIVERSAL ENGINE LATHE.

Swings 7 inches; length of bed 42, 48 and 54 inches; between centers 24, 30 and 36 inches; hole through spindle 6-10 inch; largest hole through spring chuck 4-10 inch. Cuts from 8 to 240 threads per inch and from 4 to 120 threads per centimeter. Send for illustrated catalogue.

BALLOU MFG. CO,

Hartford, Conn.

Massey's E & K Patent VISES.



NO LOST MOTION.

Simply constructed, convenient and durable.

T. C. MASSEY,

Sole Manufacturer,

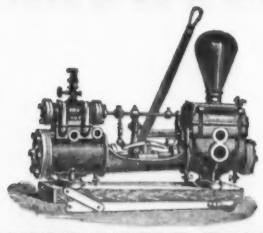
15 S. Jefferson St., CHICAGO, ILL.

Eastern Depot, *LINK BELT CO.* 81 John St., N. Y.

Write for Description.

KNOWLES PATENT STEAM PUMPS.

THE STANDARD!



THE BEST MADE PUMP! THE BEST PUMP MADE!

Estimates furnished on application for Pumping Machinery of any capacity, and to work against any pressure.

Air Pumps and Condensers for steam Engines a specialty. Will save from 20 to 30 per cent. fuel.

SEND FOR ILLUSTRATED CATALOGUE.

—ADDRESS—

KNOWLES STEAM PUMP WORKS,

93 Liberty St., New York, and 44 Washington St., Boston, Mass.

The Deane Steam Pump Co., HOLYOKE, MASS.

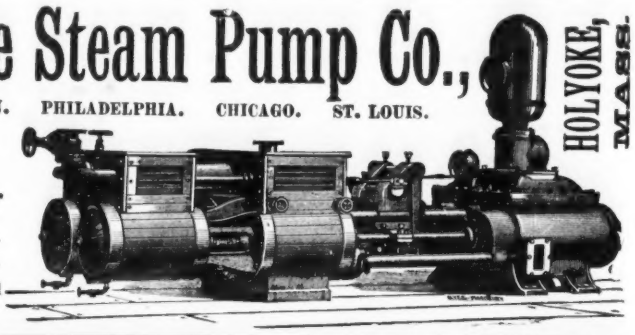
NEW YORK. BOSTON. PHILADELPHIA. CHICAGO. ST. LOUIS.

MANUFACTURE

PUMPING MACHINERY

FOR ALL DUTIES.

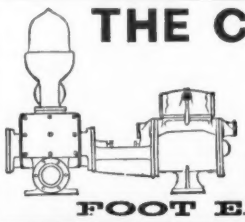
Send for New Illustrated Catalogue.



THE CAMERON STEAM PUMP.

STANDARD OF EXCELLENCE.

30,000 IN USE.



MANUFACTURED SOLELY BY

The A. S. Cameron Steam Pump Works,

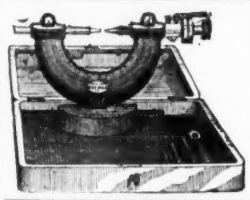
FOOT EAST 23d ST., NEW YORK.

THE BROWN HAMMER

STRIKES A BLOW WITH DOUBLE THE VELOCITY That it Raises the Hammer

A NEW MOVEMENT! SEND FOR DESCRIPTION.

KNOWLTON MFG. CO., King St., Rockford, Ill.



Prof. J. E. Sweet's MEASURING MACHINES.

Capacity 4 and 6 in. A reliable standard for machine shops. Circular on application.

Syracuse Twist Drill Co.

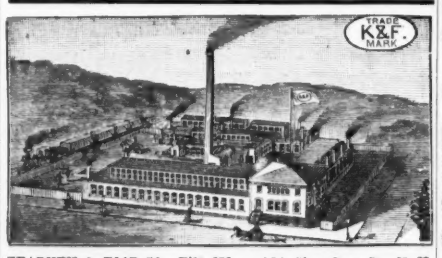
SYRACUSE, N. Y.

STEAM ENGINE FOR SALE.

Second-hand, plain horizontal, Cylinder, 16x36, with cut-off valve and main valve, brass on main bearings; crank shaft, 8in.; fly-wheel, 14 feet, with 24in. fall, with governor complete. Will be sold for reason it is not large enough for use now required. Price, where it stands (in this city), $800. A great bargain. For further particulars, call and see, or address,

D. P. PACE,

Buffalo, N.Y.



KEARNEY & FOOT CO., File Mfrs., 101 Chambers St., N. Y.

SEND FOR PRICE LIST.

The Fireman's Guide.

A Handbook on the

CARE OF BOILERS

By KARL P. DAHLSTROM, M. E.

Crown 8vo, Cloth, 50 Cents.

E. & F. N. SPON, 35 Murray St., New York.

Locomotive Engine Running and Management.

By ANGUS SINCLAIR, M. E.

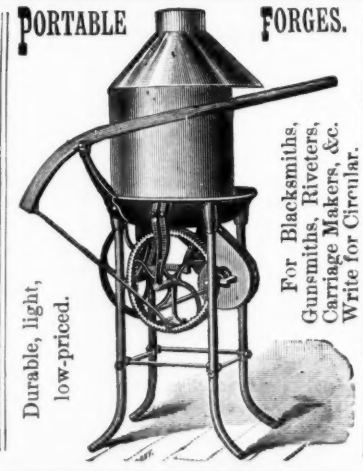
A practical book by a practical locomotive engineer. It treats of the proper way to handle engines, running different kinds of trains, from the limited express to way freight, with plain directions how to act in any case of trouble with the engine. Valve gear and link motion made plain by numerous engravings. Easy directions regarding setting valves. The working of the Westinghouse air brake carefully explained and clearly illustrated. Many other particulars about the locomotive that every engineer ought to know. Gives particulars of examinations that firemen must pass on leading roads before being promoted.

With many Illustrations. 12mo, Cloth. $2.00.

John Wiley & Sons, 15 Astor Place, New York.

COOKE & COMP'Y, 22 CORTLANDT STREET, NEW YORK.

PORTABLE FORGES.



Durable, light, low-priced.

For Blacksmiths, Gunsmiths, Riveters, Carriage Makers, &c. Write for Circular.

FOR SALE AT A BARGAIN

A well established and good paying machine shop and foundry, including buildings, lots, machinery and stock. The business will be carried on until sold. Address

A. FALKENAU, Leadville, Colo.,

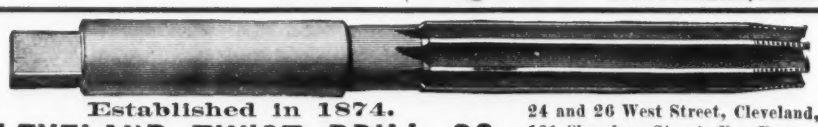
Or 123 E. 72d St., New York City.

Only reason for selling, ILL-HEALTH.

Sebastian, May & Co.'s Improved Screw Cutting FOOT or POWER LATHE.

14"x40", 6' bed, price $175. Catalogue of Lathes, Drill Presses and Machinists Tools and Supplies. Mailed on application. Lathes on Trial.

136 & 138 W. Pearl St., Cincinnati, O.



Established in 1874.

CLEVELAND TWIST DRILL CO.

24 and 26 West Street, Cleveland, O.
101 Chambers Street, New York.
85 Queen Victoria St., London, Eng.

FRICTION CLUTCH PULLEYS AND CUT-OFF COUPLINGS.

JAS. HUNTER & SON, North Adams, Mass.

STANDARD TOOL CO., Cleveland, Ohio. W. A. BABCOCK. Manager.

Second-Hand Planing Machine For Sale.

To plane 50 inches wide, 46 inches high, and 28 feet long; arranged to widen out to 70 inches. Ready for delivery and can be seen at our works. This machine is in good order, and will be sold at a bargain. Apply to

BETTS MACHINE CO., Wilmington, Del.

NICHOLSON FILE CO.,

SOLE MANUFACTURERS OF

FILES AND RASPS

HAVING THE INCREMENT CUT.

Also, FILERS' TOOLS AND SPECIALTIES.

"Nicholson File Co's" Files and Rasps, "Double Ender" Saw Files, "Slim" Saw Files, "Racer" Horse Rasps, Handled Rifflers, Machinists' Scrapers, File Brushes, File Cards, Surface File Holders, Vise File Holders, Stub Files and Holders, Improved Butchers' Steels.

Manufactory and Offices at **PROVIDENCE, R. I., U. S. A.**

REDUCED PRICES OF LeCOUNT'S STRAIGHT TAIL DOG.

To be driven from a Stud in the Face Plate.

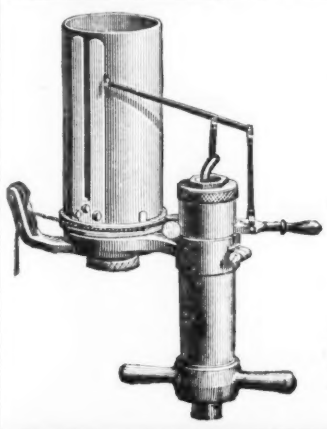
No.	INCH.	PRICE.	No.	INCH.	PRICE
1	¾	$0.60	10	2¼	$1.35
2	⅞	.70	11	2½	1.45
3	1	.70	12	3	1.60
4	1⅛	.80	13	3½	1.80
5	1¼	.80	14	4	2.10
6	1⅜	.95	15	4½	2.75
7	1½	.95	16	5	3.25
8	1¾	1.10	17	5½	4.00
9	2	1.20	18	6	5.00
1 Set to 2 in.		7.80	Full Set		31.10

C. W. LeCOUNT, South Norwalk, Conn.

TESTIMONIAL

ON THE MERITS OF THE

TABOR INDICATOR.



Office B. W. Payne & Sons, Elmira, N. Y.
ESTABLISHED 1840.
BUILDERS' PORTABLE, SEMI-PORTABLE & STATIONARY AUTOMATIC ENGINES.
The Ashcroft Manufacturing Co.,
111 Liberty Street, New York.

Gentlemen—In relation to Indicators we would say that we have had in frequent use during the past year a pair of your **Tabor Indicators** and a pair of Crosby instruments. *We prefer the Tabor*, as the diagrams are much more satisfactory than those from the Crosby. Very respectfully,

(Signed), B. W. PAYNE & SONS.

New York Engineering Company,

64 CORTLANDT STREET, NEW YORK,

Contractors for

SHAFTING, GEARING,

And all Machinery Required for the Transmission of Power.

WATER WORKS MACHINERY

A SPECIALTY.

Correspondence Solicited. Pond Engineering Co., St. Louis, Mo.

ROOFING.

For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents wanted. T. NEW, 32 John Street, New York

CHARLES MURRAY

ENGRAVER ON WOOD

58 ANN ST. NEW YORK.

BOUND VOLUMES OF THE AMERICAN MACHINIST

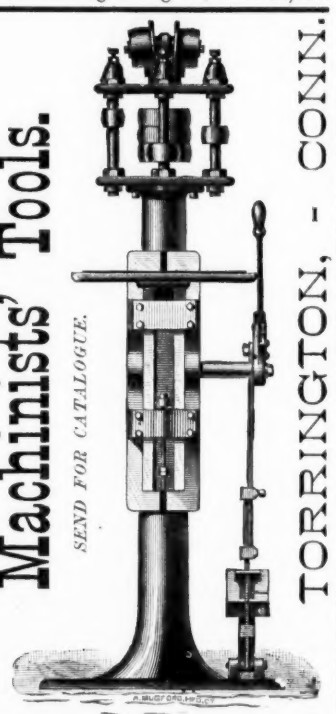
for 1880, 1881, 1882, 1883 and 1884, cloth, $3.50 each, purchasers paying express charges.
Am. Machinist Pub'g Co., 96 Fulton St., New York

THE HENDEY MACHINE CO.

MANUFACTURERS OF

Machinists' Tools.

SEND FOR CATALOGUE.



TORRINGTON, - CONN.

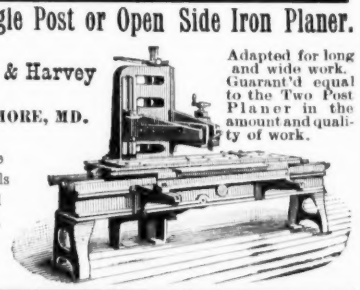
3-SPINDLE DRILL.

The Single Post or Open Side Iron Planer.

Detrick & Harvey

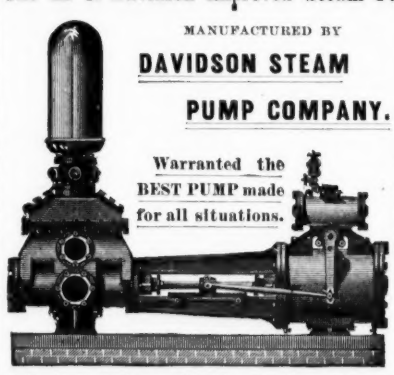
BALTIMORE, MD.

Manufacture Machine Tools and Special Machinery.



Adapted for long and wide work. Guarant'd equal to the Two Post Planer in the amount and quality of work.

The M. T. Davidson Improved Steam Pump,



MANUFACTURED BY

DAVIDSON STEAM PUMP COMPANY.

Warranted the BEST PUMP made for all situations.

PHILADELPHIA AGENT: DANIEL KELLY, 51 N. Seventh St.

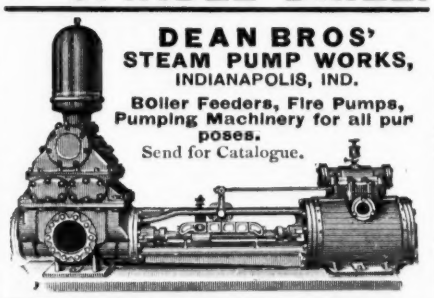
Principal Office, 77 Liberty St., New York.

DEAN BROS' STEAM PUMP WORKS,

INDIANAPOLIS, IND.

Boiler Feeders, Fire Pumps, Pumping Machinery for all purposes.

Send for Catalogue.



SEND FOR LIST

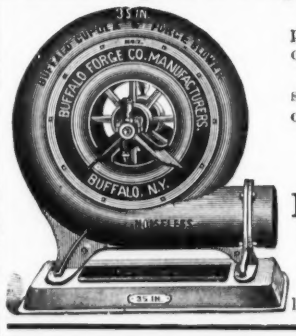
—or—

Finished Iron Pulleys @ 4 cents per pound.
Rough " " @ 2½ " " "

THE JOHN T. NOYE MANUF'G CO.,

BUFFALO, N. Y.

Buffalo Cupola & Forge Blowers.



Warranted superior to any other make.

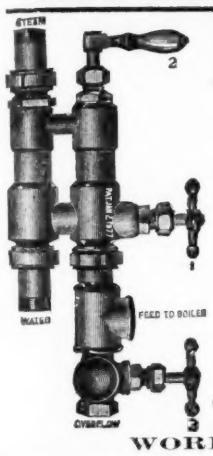
All sizes and styles of every class of work.

BUFFALO FORGE CO.

Buffalo, N. Y.

Send for Catalogue and prices.

THE HANCOCK INSPIRATOR.



THE STANDARD

BOILER FEEDER FOR ALL CLASSES OF BOILERS.

OVER 70,000 IN USE.

Send for Circulars and Price Lists.

THE HANCOCK INSPIRATOR CO.,

OFFICE, 33 INDIA WHARF, BOSTON, MASS.

WORKS, BALDWIN STREET, BOSTON.

PHOTOGRAPHIC OUTFITS

MICROSCOPES,
TELESCOPES,
FIELD-GLASSES,
MAGIC LANTERNS,
BAROMETERS,
THERMOMETERS.

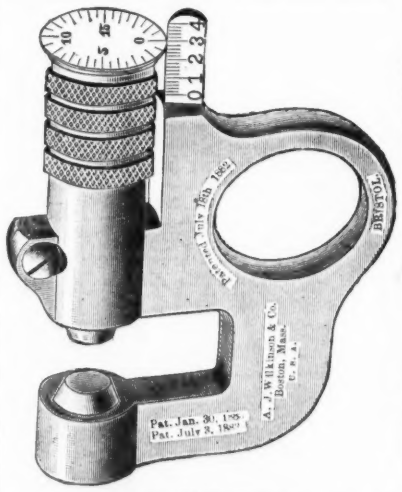
Drawing Instruments, Philosophical and Chemical Apparatus.

List and Descriptions of our Ten Catalogues sent FREE on application.

QUEEN & CO.

924 Chestnut St. Philadelphia.

IMPROVED COVERED SCREW SHEET METAL or PAPER GAUGE



Send for Illustrated Catalogue with Tables.

A. J. WILKINSON & CO.,

BOSTON, MASS.

Makers of the most complete assortment of

Micrometer Calipers & Fine Measuring Tools

To be found in the United States.

TACK

Wire Nail, Shoe Nail and Steel Shank

MACHINERY.

Tack Machines of the well known Siras Gurney pattern, weighing from eleven hundred and fifty to sixteen hundred pounds, *acknowledged to be the best machine in the market.* Fully warranted in every particular.

KEITH & TRUFANT,

CAMPELLO, MASS.

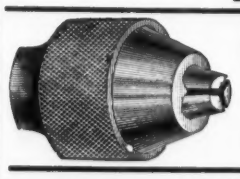
NOTICE OF SALE.

Having disposed of my patents, drawings, patterns, tools, goodwill and everything connected with my milling machine business to the BROWN & SHARPE MFG. CO., of Providence, R. I., I refer further orders and inquiries to them.

Thanking the public for past favors, I am very respectfully,

March 10, 1885. C. E. LIPE, Syracuse, N. Y.

Almond Drill Chuck



Sold at all Machinists' Supply Stores.

T. R. ALMOND,

83 & 85 Washington St., Brooklyn, N. Y.

SHAPING MACHINES

For Hand and Power, 6", 8" and 10" Stroke.

Adapted to All Classes of Work to their Capacity.

CIRCULARS FURNISHED.

BOYNTON & PLUMMER,

Worcester, Mass.

THE GARDNER GOVERNOR.

Over 30,000 in use.

Adapted to every style of stationary and portable steam engine.

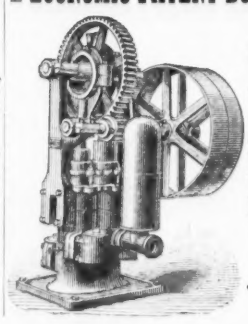
Warranted to give satisfaction or no sale.

For circulars and prices, address,

The Gardner Governor Co.,

QUINCY, ILL.

THE ECONOMIC PATENT BOILER FEED PUMP,



Manufactured by

I. B. DAVIS & SON,

Hartford, Conn.

The Only Double-Acting Geared Pump.

It is compact and Systematic in design and Economical in its operation. All its parts are arranged for durability.

BENJ. F. KELLEY, Agent,

91 Liberty St., New York.

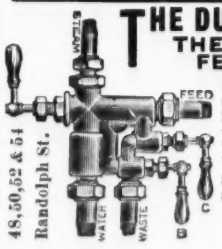
Philadelphia Office:

JAMES BERRYMAN,

125 North Fourth St.

THE DUPLEX INJECTOR

THE BEST BOILER FEEDER KNOWN.



48, 50, 52 & 54 Randolph St.

Not liable to get out of order. Will lift water 25 feet. Always delivers water *hot* to the boiler. Will start when it is hot. Will feed water through a heater. Manufactured and for sale by

JAMES JENKS & CO.,

Detroit, Mich.

WORTHINGTON PUMPING MACHINERY

HENRY R. WORTHINGTON,

New York.

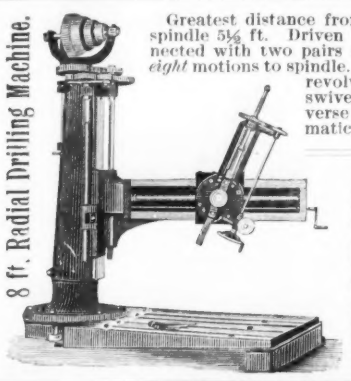
Boston, Pittsburgh, Chicago, Cincinnati, Cleveland, St. Louis, San Francisco.

SEND FOR Illustrated Catalogue.

WM. B. BEMENT & SON,

PHILADELPHIA.

* * * A Large Line of SPECIAL TOOLS for Railway Purposes.



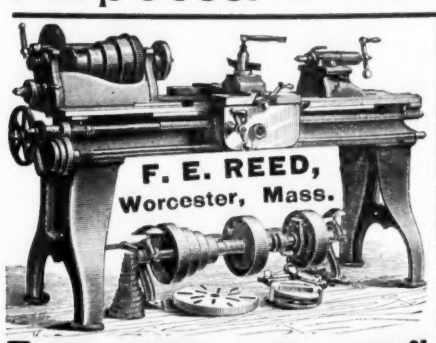
8 ft. Radial Drilling Machine.

Greatest distance from base plate to lower end of spindle 5¼ ft. Driven by cone of four changes, connected with two pairs of intermediate gears, giving *eight* motions to spindle. Arm slides by power. Sleeve revolves on friction rollers. Spindle swivels to any angle, has 18 in. traverse and three changes of automatic feed.

MANUFACTURERS OF

Lathes, Planers, Drills, (Upright, Radial, Horizontal & Multiple), Shapers, Slotters, Milling Machines, Boring and Turning Machines, Steam Hammers, Steam and Hydraulic Riveters, Cranes, Punches, Shears,

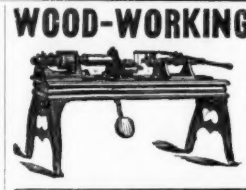
Bending Rolls, Plate Planers, &c.



ENGINE * LATHES, * HAND * LATHES

Slide Rests and Planer Centers.

WOOD-WORKING MACHINERY



For Planing Mills, Furniture, Chair and Cabinet Factories, Cabinet Works and General Wood-Working. Send Stamp for Illustrated Catalogue to

ROLLSTONE MACHINE CO.
45 Water St.,
FITCHBURG, MASS., U.S.A.

GRANT MACHINE TOOL WORKS,

Flushing, N. Y.

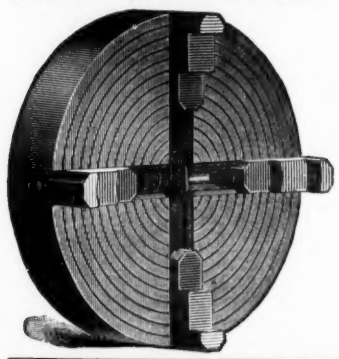
JOHN J. GRANT, PROPRIETOR.

Manufacturer of

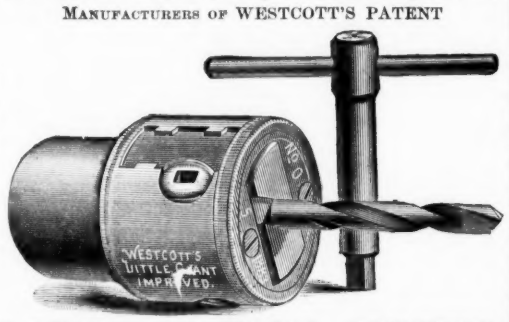
FIRST-CLASS MACHINE TOOLS.

ONEIDA STEAM ENGINE & FOUNDRY COMPANY, - ONEIDA, N. Y.

MANUFACTURERS OF WESTCOTT'S PATENT



NEW CATALOGUE READY.



LATHE and DRILL CHUCKS.

CYLINDER TALLOW. FREE OF ACID.

A. H. VAN CLEVE, Gen'l Purchasing Ag't, Camden & Amboy R. R. & Transportation Co. wrote from South Amboy, January 22, 1872: L. M. ELKINTON has furnished the United Companies of New Jersey, since March, 1869, and during 1870 and 1871, over 170,000 pounds CYLINDER TALLOW which has given the Motive Power Department and Steamboat Machine Department entire satisfaction.

I believe Mr. Elkinton's Tallow to be free from the acids so destructive to Steam Cylinders and Valves, which is generally found in the tallow usually offered for sale in the market.

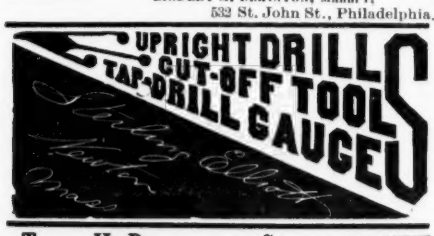
LINDLEY M. ELKINTON, Manufr,
532 St. John St., Philadelphia.

CRANK PLANERS

Superior Design & Workmanship, Extra Heavy (1500 lbs.)

—DOWN, ANGULAR AND CROSS-FEED,—
TO PLANE 18X16X16.

R. A. BELDEN & CO., DANBURY, CT.



—THE—

Hartford Drill Chuck

contains the maximum of power, durability and efficiency, and is fully guaranteed. No. 1 holds from 0 to ¼", price $7. No. 2 (round body) holds from 0 to ¾", price $8. Sold by the trade.

Address,

A. F. CUSHMAN,
HARTFORD, CONN.

Manufacturer of all kinds of Chucks.

Send for new Illus'd Catalogue.

THOS. H. DALLETT & CO.

8 N. 21st St., Philadelphia, Pa.

Manufacturers of

PATENT

Portable Drilling Machines

VERTICAL DRILLS,

Radial Drills, Multiple Drills,

HAND DRILLS.

New Illustrated Catalogue just issued.

TACK & SHOE MACHINERY

SWEETSER & MERRITT,
BROCKTON, MASS.

Stow Flexible Shaft Co.

(LIMITED)

15th & Penna. Ave.

PHILADELPHIA.

Manufacturers of

TOOLS for Emery Wheel Grinding, Metal and Wood Polishing and Horse and Cattle Brushing and Clipping.

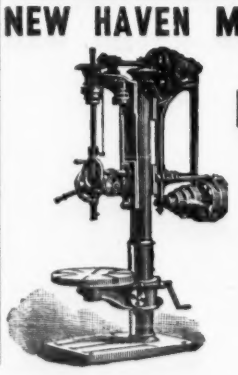
PORTABLE Tapping, Reaming —AND— Boring Machines.

Having greater facilities for **GEAR CUTTING** than we need at present we are prepared to cut accurately and with dispatch, all sizes of spur and bevel gears, from the smallest to 30 inches diameter.

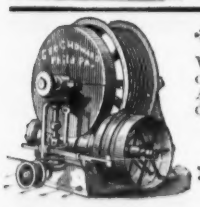
S. ASHTON HAND MFG. CO., TOUGHKENAMON, Chester Co., Pa.

NEW HAVEN MANUF'G CO.,

New Haven, Conn.



Lathes, Planers, Shapers, Slotters, Etc.



ELEVATORS

With Screw or Spur Gear, operated with belts or hand; Automatic Hatch Doors; Hydraulic or Steam Elevators or Hoists.

GEO. C. HOWARD,
19 S. 13th St., Philadelphia.
12 Cortlandt St., New York.

ABSOLUTELY SAFE FROM EXPLOSION. BOILERS ECONOMICAL DRY STEAM. MERITS PROVEN 18 YEARS RECORD

BOILERS READILY ENLARGED STATIONARY OR PORTABLE. IMMEDIATE DELIVERY.

CORRESPONDENCE SOLICITED. HARRISON SAFETY BOILER WORKS GERMANTOWN JUNC. PHILA. PENNA.

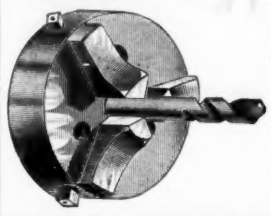
GENERAL AGENTS GRAYDON & DENTON AFIELD 261 PARK PLACE, NEW YORK.

ESTABLISHED 1851.

The Horton Lathe Chuck,

ALSO

CHUCKS



for Brass Finishers' Use, Milling Machines, Screw Machines, Upright Drills, Cutting-Off Machines, Drill Lathes, and for Boring Mills for Car Wheel and other work.

THE E. HORTON & SON CO.

Canal St., Windsor Locks, Conn., U. S. A.

THE STANDARD REVOLUTIONS COUNTER.

Ulster Machine Co.
E. D. WILLIAMS, Pres't.

Send for Circular.
Box 1488.
Providence, R. I.

PAT. STOP MOTION.

Registers 2,000 Revolutions.

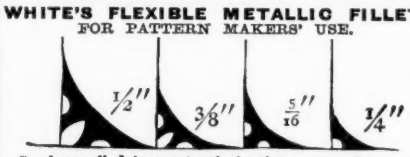
CURRIER & SNYDER,

Upright Drills,

WORCESTER, MASS.

WHITE'S FLEXIBLE METALLIC FILLET,

FOR PATTERN MAKERS' USE.



Can be applied in one-tenth the time required to carve curved fillets. Send for sample. H. B. Smith Machine Co., Mfrs. of Wood Working Machinery, 925 Market St., Phila.

KELLAM'S STEAM DAMPER REGULATOR,

MANUFACTURED BY

HIRAM KELLAM,
— Detroit, Mich. —

Great economizer of fuel and a PERFECT SAFEGUARD. Made entirely of steam metal, without packing, diaphragm or stuffing box. Operated by direct steam. Guaranteed to work closer to boiler pressure than any regulator in use.

OVER 10,000 IN USE.

SEND FOR DESCRIPTIVE CIRCULAR.

SOLE SALES AGENTS:

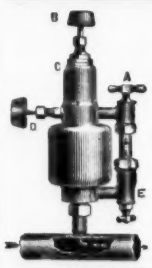
HINE & ROBERTSON,
12 CORTLANDT ST., NEW YORK.

Manufacturers of Machinists' Tools,

WORCESTER, MASS.

CRAIC'S

New "Class C" Lubricator



Manufactured by

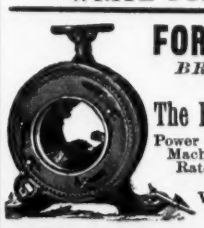
The Craig Sight Feed Lubricating Co.

LAWRENCE, MASS.

Manufacturers of

Sight Feed Lubricators for Locomotives, Stationary, Marine, Portable & Pumping Engines.

WRITE FOR CIRCULAR.



FORBES & CURTIS,

BRIDGEPORT, CONN.

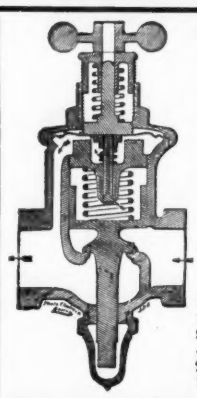
Manufacturers of

The Forbes Pat. Die Stocks,

Power Pipe Cutting and Threading Machines, Cutting-off Machines, Ratchet Drills, Special Machinery, etc., etc.

WRITE FOR CATALOGUE. Mention Paper.

CURTIS Pressure Regulator



For Steam, Water & Air.

Manufactured by

Curtis Regulator Co.,

51 BEVERLY STREET,

Boston, - Mass.

General Agencies:
109 Liberty St., New York.
19 No. 7th St., Philadelphia.
86 & 88 Market St., Chicago.
49 Holliday St., Baltimore.
24 Sixth St., Pittsburgh, Pa.
707 Market St., St. Louis, Mo.

"Lightning" Speed Indicator

Registers up to 1000; will stand 10,000 rotations per minute. Spindle has *Rubber Tip* (pat. app'd for) to prevent slipping, and also to break electric light current when used on dynamo. Has silver plated dial and glass crystal, excluding dust. Spindle, ½", 1" 2" or 3", as ordered. Sent by mail for **$2.50.** Discount to dealers.

J. H. WALLACE, General Agent,
25 MAIDEN LANE, N. Y.

WORK SHOPS

WITHOUT STEAM POWER

BY USING OUTFITS OF

BARNES' PAT. FOOT POWER machinery can compete with steam power. **Sold on trial.** Metal and woodworkers send for prices. Illustr'd catalogue free.

W. F. & Jno. Barnes Co.
Rockford, Ill.

Address No 19.5 Main St.

FAY & SCOTT, Dexter, Me.

MANUFACTURERS OF

WOOD LATHES,

Drill Lathes, Shaping Machines, Milling Machines, Planer Centers, &c.

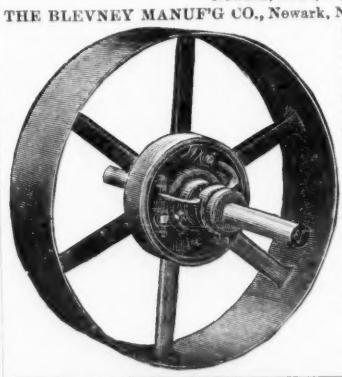
SEND FOR CATALOGUE.

Adjustable Caliper Gauge Tools for Amateurs' and Watch Makers' Lathes. Send for Circular.

THE FARTFORD TOOL CO., Hartford, Conn.
S. A. SMITH, 59 S. CANAL ST., CHICAGO, ILL., Western Agent.

EDMUND JOST, Brass Founder and Finisher.
Newark, N. J., Sept. 19, 1884.

THE BLEVNEY MANUF'G CO., Newark, N. J.



Gentlemen: I take pleasure in giving you my opinion regarding your clutches, of which I have had seven in use for the last eight months.

I find them perfect in every respect and the ease with which they are operated is remarkable.

Yours truly,
Edmund Jost.

BEVEL GEARS,

Cut Theoretically Correct.

For particulars and estimates apply to

BREHMER BROS.,
Machinists,
440 N. 12th St., Philadelphia, Pa.

FOX AND TURRET SPEED LATHES.

BRASS FINISHERS' TOOLS.

GEO. GAGE, WATERFORD, N. Y.

E. P. BULLARD, Ag't., 14 Dey St., NEW YORK.

J. H. WILLIAMS & CO.
COR. RICHARDS & BOWNE STS. (NEAR HAMILTON FERRY) BROOKLYN, N.Y.
IRON AND STEEL
DROP FORGINGS
OF THE BEST QUALITY.
NEW BUILDINGS & MACHINERY ESPECIALLY ADAPTED FOR THE BUSINESS
ESTIMATES GIVEN ON RECEIPT OF MODELS.

Morse Twist Drill and Machine Company, *New Bedford, Mass.*

SOLE MANUFACTURERS OF

MORSE PATENT STRAIGHT-LIP INCREASE TWIST DRILL.

Solid and Shell Reamers, Beach's Patent Self-Centering Chuck, Bit Stock Drills.

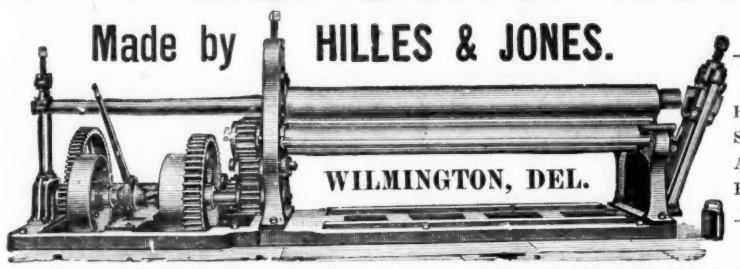
Drills for Coes, Worcester, Hunter and other Hand Drill Presses. Drill Grinding Machines, Center and Adjustable Drill Chucks, Taper Reamers, Milling Cutters, and Special Tools to order.

ALL TOOLS EXACT TO WHITWORTH STANDARD GAUGES.

GEO. R. STETSON, Sup't. **EDWARD S. TABER, Pres't and Treas.**

PATENT PLATE BENDING ROLLS

Made by HILLES & JONES.

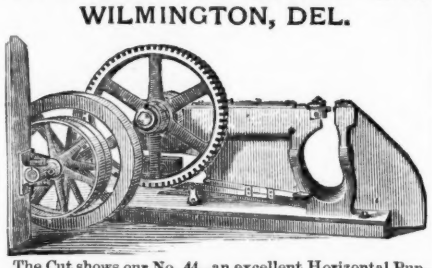


THE CUT REPRESENTS ALL SIZES THAT ARE DRIVEN BY BELTS.

It is but the work of a moment to balance the top roll and lower the hinge housing to take out the plate when a full circle is bent. The rolls are all made of solid wrought iron, the balance bar being a part or extension of the top roll. There is a cast iron bed-plate under the entire machine. To save any shifting of belts we put in Friction Pulleys, which enable the rolls to be started, stopped or reversed instantly.

THE PUSEY & JONES CO.

WILMINGTON, DEL.



The Cut shows our No. 44—an excellent Horizontal Punching Machine, making a one-inch diameter Hole through one-inch iron, and also useful for punching stay-bolt holes in furnace sheets after the sheets have been fitted.

BUILDERS OF STEAM ENGINES,

Boilers, Tanks, Machinery for Rolling Mills, Punches, Shears, Riveters, Angle Iron Cutters, Cranes and heavy Iron Work generally

Watson & Stillman,

468 Grand St., New York,

MANUFACTURERS OF

Hydraulic Jacks & Punches [Improved 1884.]

Hydraulic Presses, Pumps and Fittings.

Lever and Screw Punches and Shears.

Polishing and Buffing Machinery, Wheels, &c.

J.S.GRAHAM — JOHN KANE

J.S.GRAHAM & CO.

TRADE — MARK

WOOD — WORKING

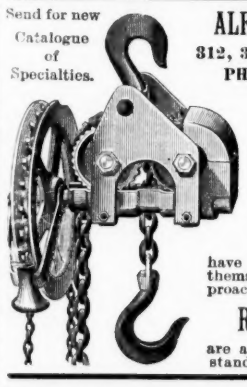
SEND FOR CATALOGUE. — MACHINERY — FACTORY ST. ROCHESTER, N.Y.

VOLNEY W. MASON & CO.,

Friction Pulleys, Clutches and Elevators,

PROVIDENCE, R. I.

Send for new Catalogue of Specialties.



ALFRED BOX & CO.

312, 314, 316 Green Street, PHILADELPHIA, PA.

— Manufacturers of —

BOX'S PAT.

Double Screw Hoists.

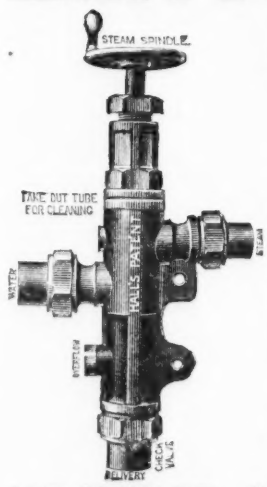
13,000 IN USE.

Many have done hard, continuous duty 5 years without a single part being renewed. This is the key of our success. They have built up a reputation themselves that cannot be approached. Our improved

RADIAL DRILLS

are also assuming the same standard.

HALL'S PATENT Automatic Injectors.



For supplying all classes of steam boilers with water. We guarantee these Injectors to be the best, simplest and only thoroughly reliable Boiler Feeders in the world, working from 2 lbs. to 200 lbs. steam pressure.

HALL'S Engineering CO.,

112 JOHN ST., NEW YORK.

The Waterbury Farrel Foundry & Machine Co

WATERBURY, CONN.

Patent Power Presses,

DROP PRESSES,

Foot Presses, Rolling Mills, Rivet Machines, Spinning Machines, Gang Slitters,

Special Machinery

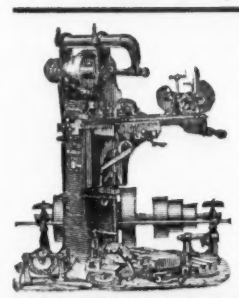
for Sheet Metal, Wire, Etc.

J. C. HOADLEY,

CIVIL AND MECHANICAL ENGINEER

and Expert in Patent Causes,

28 STATE STREET, ROOM 28, BOSTON, MASS.



Contracts solicited for Special Machines, Patent Devices, &c., in quantity.

Complete outfit for Machinists, Blacksmiths, Metal - Workers and others.

New Circular on Milling Machine and Universal Head (Pat. Pending.)

THE CINCINNATI SCREW & TAP CO.

S. E. Cor. Pearl & Plum Streets,

CINCINNATI, OHIO.

MACHINE MOULDED Spur and Bevel GEARS

Pulley Castings, &c.

Special Inducements to the Trade.

LIST MAILED ON APPLICATION.

POOLE & HUNT,

BALTIMORE, MD.

D. SAUNDERS' SONS, Yonkers, N.Y.

MANUFACTURERS OF

Steam and Gas Fitters' Hand Tools.

SEND FOR CIRCULAR.

Pipe Cutting, THREADING, AND Tapping Machines.

THE PATENT WHEEL PIPE CUTTER shown in the cut combines simplicity with strength and lightness. Easily adapted to various sizes of pipe. Rolling instead of sliding motion. No loose parts to become detached and mislaid. All wearing surfaces are of tool steel, hardened. Less friction of parts than any other pipe-cutter made.

THE

Slate Sensitive Drill

Adapted to rapid work with small drills. Its extreme sensitiveness prevents clogging and breakage of drills. Has a swinging table with attachment for center drilling. Instantly adjustable to different lengths of work. Over 200 already in use. Send for Circular.

DWIGHT SLATE,

Hartford, Conn.

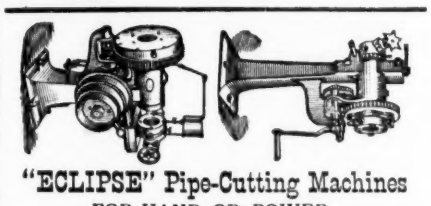
EUREKA BAND SAW.

We build three sizes at prices lower than an equally good Band Saw can be had elsewhere. For further information inquire of

FRANK & CO.,

176 Terrace Street.

—BUFFALO, N. Y.—



"ECLIPSE" Pipe-Cutting Machines

FOR HAND OR POWER.

Don't you have sufficient Pipe-Work about your Mill, Factory, or Shops to make a powerful, convenient and very compact Pipe-Cutting Machine soon pay for itself, providing it could be had at a moderate price?

Mention this paper and write us for particulars.

PANCOAST & MAULE,

Philadelphia, Pa.

Made In Three Sizes, Cutting Pipes ¼ to 6 inch.

ARMSTRONG'S

Improved Adjustable Stock & Dies

FOR PIPE AND BOLTS.

Tapped to Standard Gauges. *Adjustable* to all variations in the size of fittings. Can be *resharpened without drawing the temper* by simply grinding them. Possessing practical advantages appreciated by all mechanics. Circulars sent free on application.

Manufactured by F. ARMSTRONG, Bridgeport, Conn.

If You Want the Best STEAM PUMP

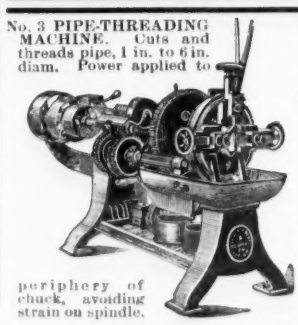
For Mining, Railroad or Steamboat use, Paper Mill, Chemical or Gas Works, Tannery, Brewery or Sugar Refinery, Drainage Quarries, Cellars or Plantations, Irrigating or Hydraulic Mining, Sinking Foundations, Coffer Dam, Sewer, Well Sinking and other Contractors' Work, or Raising Water for any kind of Manufacturing or Fire Purpose; write for an illustrated descriptive book on the New Pulsometer, containing greatly reduced prices, hundreds of testimonials, etc. Mailed free. Prices 10 per cent. lower than others. Every Pump tested before shipment and guaranteed as represented. Economy and Efficiency Unequaled. Pulsometer Steam Pump Co., 83 John St., N.Y. See prices next issue of this paper.

Iron and Steel

DROP FORGING

Of Every Description, at Reasonable Prices.

R. A. BELDEN & CO., DANBURY, CT.



No. 3 PIPE-THREADING MACHINE. Cuts and threads pipe, 1 in. to 6 in. diam. Power applied to periphery of chuck, avoiding strain on spindle.

No gearing changed in regulating speeds. Also made with steam engine attachment when desired.

THE EATON, COLE & BURNHAM CO.

82 & 84 Fulton Street, New York,

MANUFACTURERS OF

PIPE CUTTING and THREADING MACHINES

OPERATED BY HAND OR POWER.

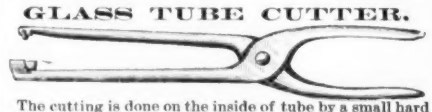
FITTINGS, VALVES, PIPE, PIPE TOOLS,

AND ALL STYLES OF IRON AND BRASS GOODS FOR

STEAM, WATER AND GAS.

Factory, Bridgeport, Conn.

GLASS TUBE CUTTER.



The cutting is done on the inside of tube by a small hard steel wheel. Will cut any size or grade of glass tube. No practice required to operate.

Price $2.50 each, (Discount to dealers.)

Manufactured by HUNT & CONNELL, (Limited.)

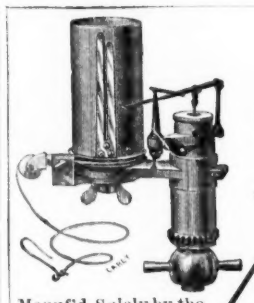
SCRANTON, PA.

DRAWING INSTRUMENTS

Send for 72-Page Illustrated Catalogue.

WM. T. COMSTOCK,

6 ASTOR PLACE, NEW YORK



Manuf'd Solely by the

American Steam Gauge Co.,

Boston, Mass.

SEE REFERENCE.

Engineers allowed special terms.

AMERICAN STEAM GAUGE CO.,

Gentlemen:—Having used the THOMPSON IMPROVED INDICATOR on many different styles of engines, at speeds varying from 17 revolutions up to 350, with marked success, I have no hesitation in saying that I consider the THOMPSONS Improved Indicator a very valuable adjunct to an engine's or engineer's outfit.

Boston, June 1, 1884.

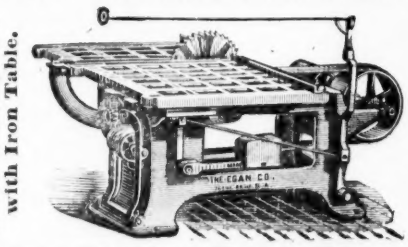
Yours very truly,

C. H. ATKINS,

with Knowles Steam Pump Works

WOOD-WORKING MACHINERY

No. 2 Railway Saw with Iron Table.



THE EGAN COMPANY, Mfrs.,

Successors to The Cordesman & Egan Co.,

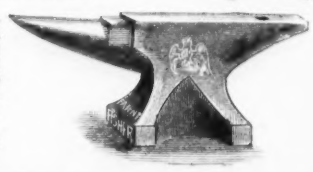
201 to 221 WEST FRONT STREET, - CINCINNATI, OHIO.

EAGLE ANVIL WORKS,

Trenton, N. J.

The **Fisher Double Screw Leg Vise.**—Warranted stronger grip than any other Vise. Always parallel and cannot be broken.

Send for Circulars.



The **Eagle Anvil.**—Best Cast Steel Face & Steel Horn. Better than any English Anvil. Fully warranted and lower price.

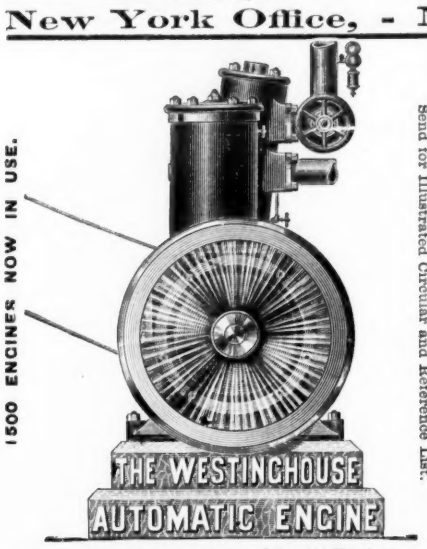
WILLIAM SELLERS & CO.,
Philadelphia, Pa.

Machine Shop and Railway EQUIPMENTS.

Shafts, Couplings, Hangers, Pulleys, Mill Gearing, etc., Lathes, Planers, Drills, Shapers, Bolt Cutters, Railway Turntables, and Pivot Bridges, Gifford Injectors, Sellers' Improvements, New Patterns, Simple, Effective.

New York Office, - No. 79 Liberty Street.

1500 ENGINES NOW IN USE.



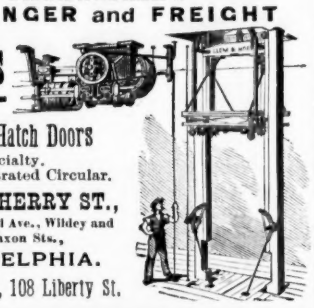
Send for Illustrated Circular and Reference List.

Our capacity being now equal to 100 Engines per month, we shall hereafter keep in stock for immediate shipment all sizes from 4 to 200 H. P.

THE
Westinghouse Machine Company,
PITTSBURGH, PA.

SALES DEPARTMENT CONDUCTED BY
WESTINGHOUSE, CHURCH, KERR & CO., 17 Cortland Street, New York.
FAIRBANKS, MORSE & CO., Chicago, Cincinnati, Cleveland, Louisville and St. Paul.
FAIRBANKS & CO., St. Louis, Indianapolis and Denver.
PARKE & LACY, San Francisco, and Portland, Oregon.
PARKE, LACY & Co., Salt Lake City, Utah & Butte, Montana.
D. A. TOMPKINS & CO., Charlotte, N. C.
KEATING IMPLEMENT & MACHINE CO., Dallas, Texas.
ROBERT MIDDLETON, Mobile, Ala.
H. DUDLEY COLEMAN, 9 Perdido Street, New Orleans, La.
IMRAY & CO., Sydney and Melbourne, Australia.
R. ROGERS, 43 Rue Lafitte, Paris.

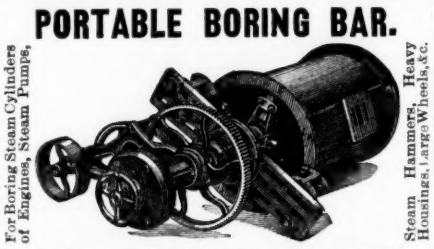
Morse Elevator Works
MORSE, WILLIAMS & CO.,
(Successors to Clem & Morse,)
Builders of All Kinds of
PASSENGER and FREIGHT
Elevators



Automatic Hatch Doors
a specialty.
Send for Illustrated Circular.
Office, 411 CHERRY ST.,
Works, Frankford Ave., Wildey and Shackamaxon Sts.,
PHILADELPHIA.
New York Office, 108 Liberty St.

PORTABLE BORING BAR.

For Boring Steam Cylinders of Engines, Steam Pumps,



Steam Hammers, Heavy Housings, Large Wheels, &c.

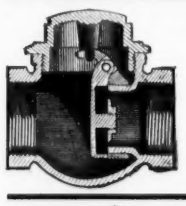
Circulars on application. Send stamp for catalogue.

L. B. Flanders Machine Works,
PEDRICK & AYER, Prop'rs,
Philadelphia, Pa.

WESTINGHOUSE, CHURCH, KERR & COMPANY,
CONSULTING AND CONTRACTING ENGINEERS,
17 Cortlandt St., - - - NEW YORK.

WE CONTROL THE EXCLUSIVE SALE OF
THE WESTINGHOUSE AUTOMATIC ENGINE,
THE REYNOLDS-CORLISS ENGINE,
THE HUYETT & SMITH FANS AND VENTILATING WHEELS,
THE AMERICAN PAPER PULLEY,
THE STERLING STEEL CO. Fine Tool Steels,

ALSO CONTRACTORS FOR
(Representing E. P. ALLIS & CO., Milwaukee, Wis.)
BLOWING ENGINES, PUMPING ENGINES, SEWERAGE PUMPS, & HEAVY MACHINERY.
FURNISHED ON APPLICATION. CIRCULARS, PLANS, AND PRICES



BURNHAM'S SELF-ADJUSTING
SWING CHECK VALVE

Users of Check Valves will please note the advantage these Valves possess over all others. The most **important claim** is, that as the **Jenkins' Disk wears, the yoke that passes around the seat moves away from the seat in proportion to the wear of the Disk, thus causing a uniform wear of the Disk until said Disk is completely worn out.**

JENKINS BROS. 71 John St., New York. 79 Kilby Street, Boston. *Send for Price List* A

SHEPARD'S NEW
$60
Screw Cutting Foot Lathe

Foot and Power Lathes, Drill Presses, Scroll Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, &c.

Lathes on trial. Lathes on payments. Send for Catalogue of outfits for amateurs or artisans.

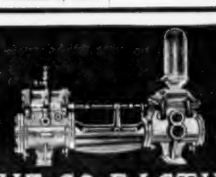
Address H. L. SHEPARD, Agent, 134 Second St., Cincinnati, Ohio.

American Twist Drill Company's
PATENT CHUCK JAWS.

3 sizes. Price per set of 4 Jaws, $40, $48, $56. Bolted to lathe face plates, they make best and cheapest chuck in the world. Address orders

HILL, CLARKE & CO., Boston and St. Louis.
MANNING, MAXWELL & MOORE, N. Y. City.
TALLMAN & McFADDEN, Philadelphia, Pa.
WM. BINGHAM & CO., Cleveland, Ohio.

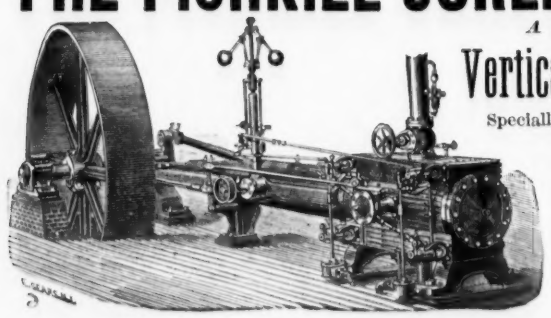
STEAM PUMPS



SEND FOR PRICES.

VALLEY MACHINE CO. EASTHAMPTON, MASS.

THE FISHKILL CORLISS ENGINE,
A FULL LINE OF SIZES.



Vertical Condensing Engines

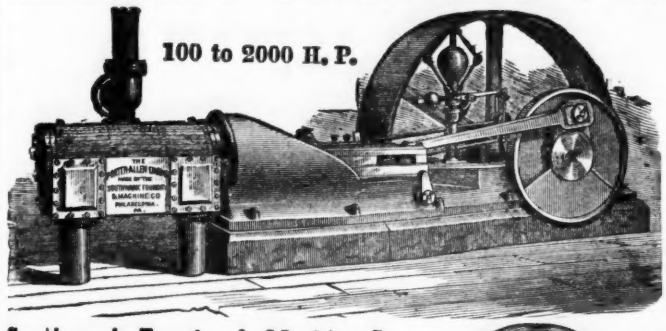
Specially adapted for and extensively used in large grain elevators.

BOILERS.

Manufactured by the
Fishkill Landing Machine Co.
FISHKILL-ON-THE-HUDSON, N. Y.

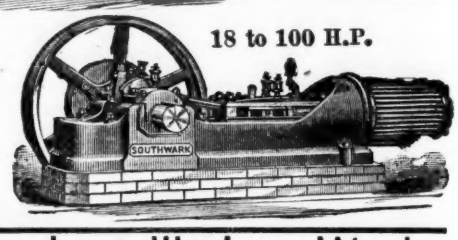
Send for Catalogue A, containing Illustrated Description and References.

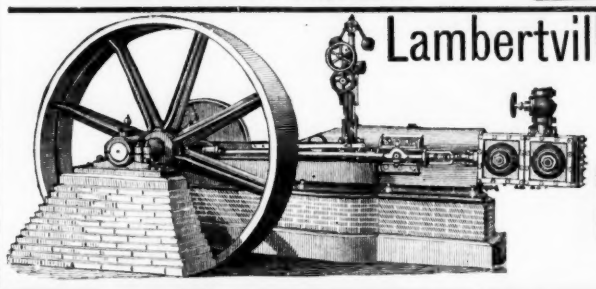
Sole Builders of "PORTER-ALLEN" and "SOUTHWARK"



HIGH SPEED ENGINES.

Southwark Foundry & Machine Co.,
430 WASHINGTON AVE.,
Philadelphia, Pa.
44 ASTOR HOUSE, NEW YORK.
154 LAKE STREET, CHICAGO.

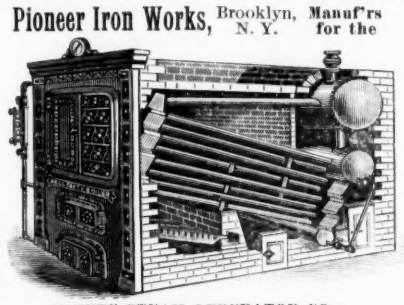




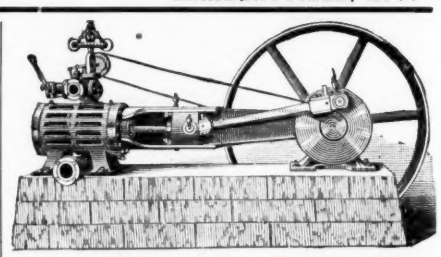
Lambertville Iron Works,
MANUFACTURERS OF
PATENT AUTOMATIC
CUT-OFF
Steam Engines
LAMBERTVILLE, N. J.

ZELL SAFETY BOILER
Pioneer Iron Works, Brooklyn, N. Y. Manuf'rs for the

SEND FOR CIRCULARS.

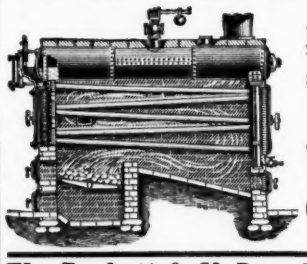


SAFETY STEAM GENERATOR CO.,
68 WARREN STREET, - - NEW YORK.



STEARNS MFG. COMPANY,
ERIE, PA.
Engines from 15 to 400 Horse Power.
Boilers of Steel and Iron supplied to the trade or the user Send for Catalogues.
SAW MILLS and GENERAL MACHINERY.
Works at ERIE, PA.

VAN DYKE WATER-TUBE BOILER.



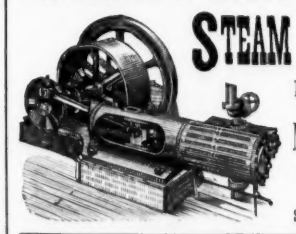
Cheapest and best boiler in market.

Safety, Economy, Durability.

VAN DYKE MFG. CO.,
60 Greenpoint Ave.
BROOKLYN, N.Y.

IRON PLANERS,
24" x 24" x 6 ft. $500.00
Other Machinist Tools at proportionally low prices.
OESTERLEIN & BERNHARDT,
170 and 172 W. 2d St., Cincinnati, O.

The Beckett & McDowell Mfg. Co.



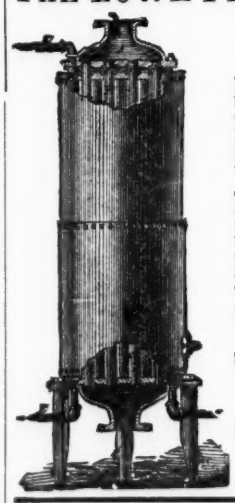
STEAM ENGINES
Hoists, Pumps
AND GENERAL
Mining Machinery.
120 LIBERTY ST.,
NEW YORK.
Send for Illus. Catalogue.

THE LAWSON NON-EXPLOSIVE BOILER

This is the only steam boiler ever devised in strict compliance with the demands of natural laws. It gives complete immunity against explosions, delivers dry steam, prevents all incrustation and deposit on the bottom plates, affords safety with high pressure, and secures great economy. The invention is applicable to every style of boiler, and can be readily applied, internally or externally, to new or old boilers. Licenses granted on liberal terms to manufacturers. Send for description.

Lawson Non-Explosive Boiler Co.,
155 & 157 BROADWAY, N. Y.

THE LOWE FEED WATER HEATER,



For Heating and Purifying Feed Water for Boilers, and other purposes, with exhaust steam from High or Low Pressure Engines.

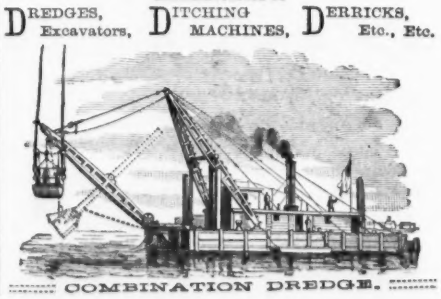
It is the simplest, most efficient, and reliable, and at less cost. Construction on the best system, saving most fuel and boiler repairs. Write for Circular and article on Heaters to

WM. LOWE,
SUCCESSOR TO
LOWE & WATSON,
Bridgeport, Conn.,
OR TO
L. M. MOYES,
Gen'l Sales Ag't,
37 DEY ST., NEW YORK.

OSGOOD DREDGE CO., - ALBANY, N. Y.

RALPH R. OSGOOD, Pres. JAMES H. BLESSING, Vice-Pres.
JOHN K. HOWE, Secretary and Treasurer.

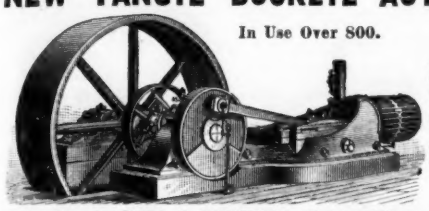
Manufacturers of
DREDGES, Excavators, DITCHING MACHINES, DERRICKS, Etc., Etc.



COMBINATION DREDGE.

NEW TANGYE BUCKEYE AUTOMATIC CUT-OFF ENGINES.

In Use Over 800.



25 to 1000 H. P.

These Engines are the combined result of long experience with automatic cut-off regulation and most careful revision of all details. They are designed and constructed for heavy and continuous duty at medium or high rotative speeds. Highest attainable Economy in Steam Consumption and superior regulation guaranteed. Self-Contained Automatic Cut-Off Engines, 12 to 100 H.P. for driving Dynamo Machines a SPECIALTY.—Illustrated Circulars with various data as to practical Steam Engine Construction and performance, free by mail. Address

BUCKEYE ENGINE CO., Salem, O.

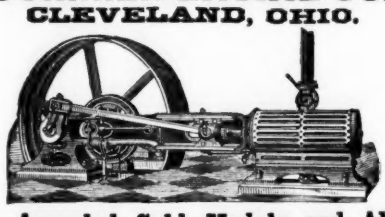
Sales Agents: GEO. A. BARNARD, 70 Astor House, N. Y., and 53 Mason Building, Boston, Mass. | D. L. DAVIS, 23 S. Canal St., Chicago, Ill., and ROBINSON & CARY, St. Paul, Minn.

KENSINGTON ENGINE WORKS, Limited, Philadelphia,

Sole Licensees and Manufacturers for New Jersey (South of Trenton), Eastern Pennsylvania, Delaware, Maryland, and Virginia.

CUMMER ENGINE CO.

CLEVELAND, OHIO.



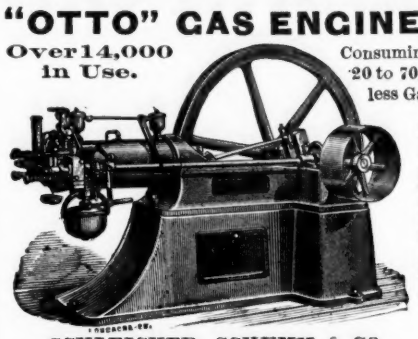
Awarded Gold Medals and All Highest Premiums for BEST AUTOMATIC ENGINE at both Cincinnati and Louisville in 1883.

Send for 150 Page Illustrated Catalogue.

"OTTO" GAS ENGINE.

Over 14,000 in Use.

Consuming 20 to 70% less Gas than any other engine.



SCHLEICHER, SCHUMM & CO.,

33d & Walnut Sts., Phila. 214 Randolph St., Chicago.

HEWES & PHILLIPS' Iron Works.

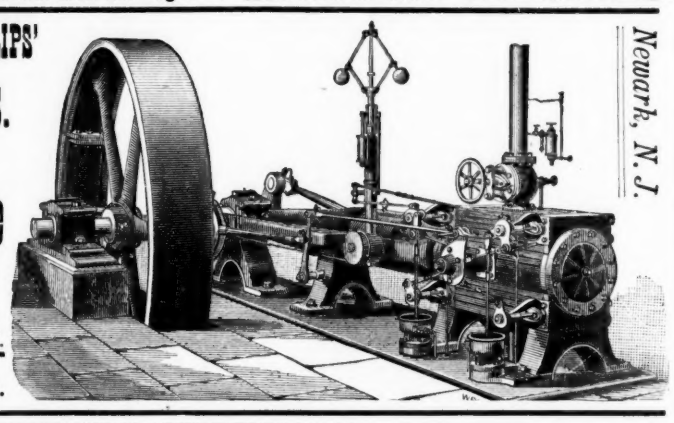
Newark, N. J.

IMPROVED

Corliss Engine

High Pressure,
—Condensing—
And Compound.

SEND FOR CIRCULAR.



BUILDERS OF

BOILERS, GAS HOLDERS, GAS GENERATORS,

WARDEN & MITCHELL,

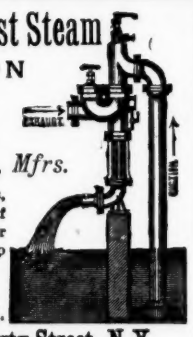
Germantown Junc., Philadelphia.

Hydraulic Riveting Plant and full facilities.

TANKS, STILLS, BRIDGES, ETC., ETC.

The Korting Exhaust Steam INDUCTION CONDENSER.

L. SCHUTTE & CO., Mfrs.



For Steam Engines and Pumps. Utilizes the remaining energy of the exhaust steam whether under suction or fall of water. No Pump required.

Offices and Warerooms: 12th and Thompson Streets, Phila.

A. ALLER, 109 Liberty Street, N.Y.

JARVIS ENG. CO., 7 Oliver St., Boston.

SELDEN'S ★PATENT★ PACKINGS.

Recommended by Leading Engineers for Steam and Hydraulic Use.

Made either *with* or *without Rubber Core.*

RANDOLPH BRANDT, 38 Cortlandt St., New York.

FRICTION CLUTCH PULLEYS,

Hoisting Engines and Hoisting Machinery,

D. FRISBIE & CO.,

478 North 5th St., Philadelphia, Pa.

SECOND-HAND IRON WORKING MACHINERY

16 in. x 6 ft. Engine Lathe. Ames. Good order.
16 in. x 6 ft. " Harrington. Good order.
20 in. x 7 ft. " Ames.
20 in. x 8 ft. " Harrington. "
24 in. x 10 ft. " Ames.
46 in. x 26 ft. " Bement. Good order.
Raised to swing. 52 in.
30x28 ft. Shafting Lathe. New Haven. Nearly new.
22x38 in. x12 Extension Lathe. Harrington.
One Brass Lathe with Chasing Bar. Cheap.
One 12 in Stroke Crank Planer. Belden.
20 in. x 4 ft. Planer. New Haven.
18 in. x 3ft. Planer. Wheeler.
30 in. x 8 ft. " Pond.
36 in. x 12 ft. " Niles. Nearly new.
42 in x 12 ft. " N. Y. S. E. Co. Good order.
One 15 in. Shaper. Hendey.
10 in. Stroke Slotter. Hewes & Phillips.
One Universal Miller. Brown & Sharpe.
One Milling Machine. Each Poole & Brainard.
One Milling Machine. No. 2 Garvin.
Four No. 2 Miller. P. & W. Lincoln Pattern. N'ly new.
One No. 1 Miller. P. & W. Nearly new.
One No. 1 Miller. Hand. P. & W. Nearly new.
One No. 2 Screw Machine. " " "
One 20 in. Drill. Prentice. " "
One 30 in. Drill. Putnam. Good order.
One Horizontal Boring and Drilling Mach. Ames.
No. 1 1-Spindle Drill. Smith & Garvin.
One Profiling Machine. Garvin 1 spindle.
One No. 4 Stiles Punch Press. New

We have a full line of new m'ch'y, and are prepared to make low quotations. Agent for the following firms. Write full particulars of what is wanted.

NEW YORK AGENT FOR

Brown & Sharpe Manufacturing Co.
Powell Machine Tool Co.
Bradley's Cushion Hammer.
National Mchy. Co. Bolt and Nut Mchy.
Hilles & Jones, Boiler Tools.
Slates Sensitive Drills.
Elliott's Drills. Gage Brass Lathes.

E. P. BULLARD, 14 Dey St., NEW YORK.

IRON-WORKING MACHINERY.

NEW.

1 Engine Lathe, each 10, 11, 12, 13, 14, 15, 16, 18, 20, 22, 24, 26, 28, 30, 36, 42 and 48 in. swing; length of bed to suit.
1 Fox Turret Lathe, each 13, 15 and 16 in. swing; 5 ft. bed.
1 Sq. Arbor Fox Lathe, 15 in. x 6 ft.
1 each, Hand Lathes, 10, 12, 14, 15 and 18 in. swing.
1 Iron Planer, each to plane 18, 20, 22, 24, 26, 30 and 36 in. wide and high; length of table to suit.
1 each, 16, 20, 22, 23, 25, 28, 30, 34, 38 and 42 in. swing Upright Drills.
1 each, 2, 3, 4 and 6 Spindle Gang Drills.
1 each, 8, 10, 12, 15, 20 and 28 in. Shapers.
1 No. 2 Milling Machine, Lincoln pattern
1 Grant & Bogert Milling Machine.
1 each, Nos. 2, 4 and 5 Screw Machines.
1 each, 3 and 7 Spindle Nut Tapper.
1 Boring and Turning Mill, each 50 and 72 in. swing.
1 Cutter Grinder.
1 12 in. x 24 in. Cylinder Horizontal Engine.
1 each 4, 5, and 6 ft. Arm Universal Radial Drills.
1 Pat. Makers Lathe, 25 in. x 12 ft. between centers.
1 Grant's New Universal Miller.
1 Pr. Bending Rolls for ⅜ in. x 60 in. plates.

SECOND-HAND.

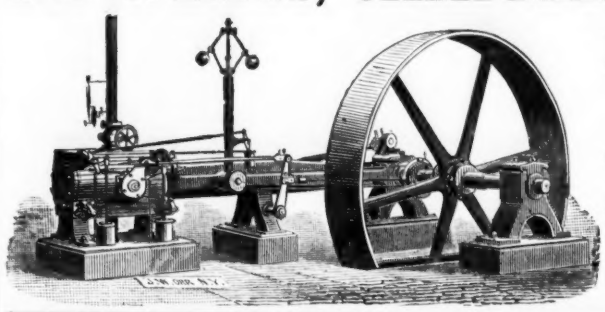
1 Engine Lathe, each 18 in. x 8ft. Good as new.
1 " " 22 x 10 ft. A1 order.
1 Iron Planer, 20 x 20 x 4 ft. A1 order.
1 " " 24 x 24 x 5 ft. " "
1 " " 30 x 30 x 7 ft. " "
1 " " 32 x 30 x 9 ft. " "
1 40 lb. Bradley Hammer.
1 Lincoln Pattern No. 2 Miller.
1 36 in. Gear Cutter.
1 Horizontal Boring Machine; takes 6 ft. between centers; 36 in. swing.

All Kinds Machinist's Tools and Supplies.

NEW YORK AGENCY OF THE TANITE CO.,
TAYLOR MFG. CO., ENGINES, BOILERS, &c.,
AND FOR THE NEW POLISHED SHAFTING.

H. PRENTISS & CO., 42 Dey St., N.Y.

THE WATTS, CAMPBELL CO., NEWARK, N. J.



MANUFACTURERS OF

Improved Corliss Steam Engines.

IN FULL VARIETY.

Sizes varying from 30 to 2000 H.P.

Horizontal or Vertical, Direct Acting or Beam, Condensing, Non-Condensing or Compound. Send for Circular.

BRANCH OFFICE:

Cor. 5th and Chestnut Sts., PHILADELPHIA, PA.

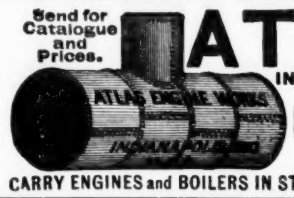
Send for Catalogue and Prices.

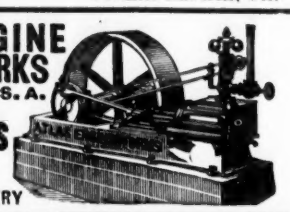
ATLAS ENGINE WORKS

INDIANAPOLIS, IND., U. S. A.

MANUFACTURERS OF

STEAM ENGINES AND BOILERS.





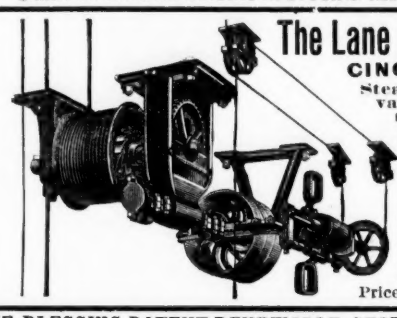
CARRY ENGINES and BOILERS IN STOCK for IMMEDIATE DELIVERY

The Lane & Bodley Co.

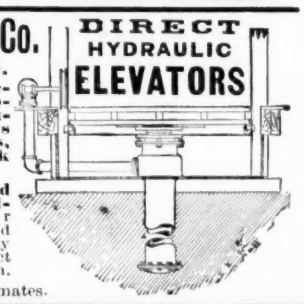
CINCINNATI, O.

Steam Power Elevators for Factories, Hydraulic Elevators for Gas Works, Side Walk Lifts, &c.

Compound Hydraulic Elevators for passengers and freight, for city service or direct pumping system.

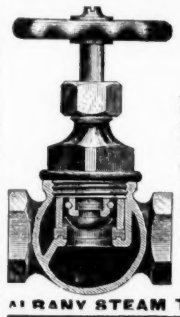


DIRECT HYDRAULIC ELEVATORS



Prices low. Get estimates.

THE BLESSING PATENT RENEWABLE-SEAT Stop and Check Valves.



The Renewable Seats and Discs are cast from the best Phosphor Bronze Metal, which has lasting qualities, double that of the best Steam Metal commonly used in first-class valves. The Seats are simply dropped into place and held in position by bottom of cage

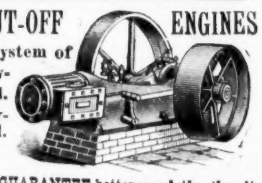
We also manufacture the Albany Bucket and Gravitating Steam Traps.

ALBANY STEAM TRAP CO., ALBANY, N. Y

AUTOMATIC CUT-OFF ENGINES

Embodying a New System of Regulation. The Governor weighs the Load.

The most perfect Governing ever obtained. Send for circular A.



BALL ENGINE CO. ERIE, PA.

WE GUARANTEE better regulation than it is possible for any other ENGINE to give.

GEORGE H. BENJAMIN,

Electrical and Mechanical Engineer,

Expert in Patent Causes and Solicitor of American and Foreign Patents.

234 BROADWAY, NEW YORK.

THE SEIBERT CYLINDER OIL CUP CO.

Manufacturers of Oil Cups for Locomotive, Marine and Stationary Engine Cylinders, under the Seibert and Gates Patents, with Sight Feed.

TAKE NOTIE.

The Sight Feed is owned exclusively by this company. See Judge Lowell's decision in the United States Circuit Court, District of Massachusetts, Feb. 23, 1882. All parties except those duly licensed by us, are hereby notified to desist the use, manufacture or sale of Infringing Cups, as we shall vigorously pursue all infringers.

THE SEIBERT CYLINDER OIL CUP CO.,

New York Office, 26 Vesey St. 53 Oliver St., Boston, Mass.

"Special Machinery."

The undersigned are prepared to make contracts for building special machinery of any description

S. S. HEPWORTH & CO.,

GLENWOOD STATION, YONKERS, N. Y.

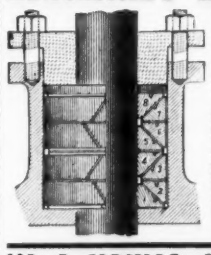
Builders of

CENTRIFUGAL MACHINES,
GENERAL SUGAR MACHINERY
—AND—
MACHINE TOOLS.

New York Office, 35 Broadway, Rooms 102 & 3.

Katzenstein's Metallic Packing,

(SELF-ACTING)



For Piston Rods, Valve Stems, &c.

Adopted and in use by the principal Iron Works, Engine Builders and Steamship Companies within the last eight years in this and foreign countries; also Tubular Metallic Packing for Slip Joints.

L. KATZENSTEIN & CO., 169 Christopher St., N.Y.

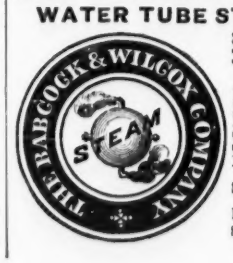
W. C. YOUNG & CO., WORCESTER, MASS. Manufacturers of

ENGINE LATHES, HAND LATHES,

Foot Power Lathes, Slide Rests, &c.

THE BABCOCK & WILCOX CO.,

WATER TUBE STEAM BOILERS.



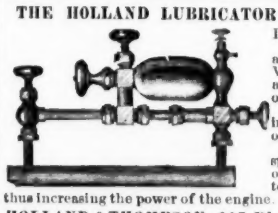
30 Cortlandt Street, New York.
107 Hope St., Glasgow, Scotland.

BRANCH OFFICES:

BOSTON: 50 Oliver Street.
PHILAD'A: 22 N. 6th Street.
PITTSBURGH: 98 4th Ave.
CHICAGO: 64 S. Canal St.
CINCINNATI: 64 W. 3rd St.
NEW ORLEANS: 54 Carondelet Street.
SAN FRANCISCO: 561 Mission Street.
HAVANA: 50 San Ignacio.

Send to nearest office for circular

THE HOLLAND LUBRICATOR VISIBLE DROP



Is guaranteed to be:

1. A perfect insurance against the cutting of Valve-seats, Cylinder, and Governor Valves of the engine.
2. It will pay for itself in 6 months in saving of oil, coal and packing.
3. It will insure more speed in the revolutions of the engine, say from 1 to 2 strokes per minute, thus increasing the power of the engine. Manufactured by

HOLLAND & THOMPSON, 217 River St., Troy, N. Y.

DROP FORGINGS OF IRON OR STEEL

BEECHER & PECK, NEW HAVEN CONN.

PECK'S PAT. DROP PRESS.

NEW HAVEN
BEECHER & PECK. CONN.

SECOND-HAND MACHINERY FOR SALE.

One Engine Lathe, 87 in. swing, 20ft. bed. Comp'd rest. Screw feed geared in face plate.
One Engine Lathe, 78 in. swing, 14 ft. bed. Comp'd rest. Screw feed geared in face plate.
One Engine Lathe, 20 ft. bed, 42 in. swing
One Engine Lathe, 16 ft. bed, 48 in. swing. Bement's make.
One Engine Lathe, 12 ft. bed, 25 in. swing. Bement's make.
One Iron Planer, planes 34 ft. long, 72 in. wide. Very heavy.
One Iron Planer, planes 24 ft. long, 62 in. x 62 in. Excellent condition.
One Iron Planer, planes 16 ft. long, 42 in. x 42 in Bement's make.
One Iron Planer, planes 11 ft. long, 36 in. x 36 in. Bement's make.
One Iron Planer, planes 8 ft. long, 30 in. x 30 in.
One Iron Planer, planes 7 ft. long, 30 in. x 30 in. New Haven make.
One Iron Planer, planes 6 ft. long, 28 in. x 28 in. Halliday make.
One 5-foot Radial Drill. Bement's make.
One 40-inch B. G. S. F. Upright Drill. N. Y. Steam Engine Co.'s make.
One 42 inch Car-Wheel Borer. Bement's make.
One 12-inch Slotting Machine.
One Axle Lathe.
Two Durrell's 7-Spindle Nut Tappers.
Send for lists New and Second-hand Tools, too long for publication

THE GEORGE PLACE MACHINERY CO.,

121 Chambers & 103 Reade Sts.,

NEW YORK.

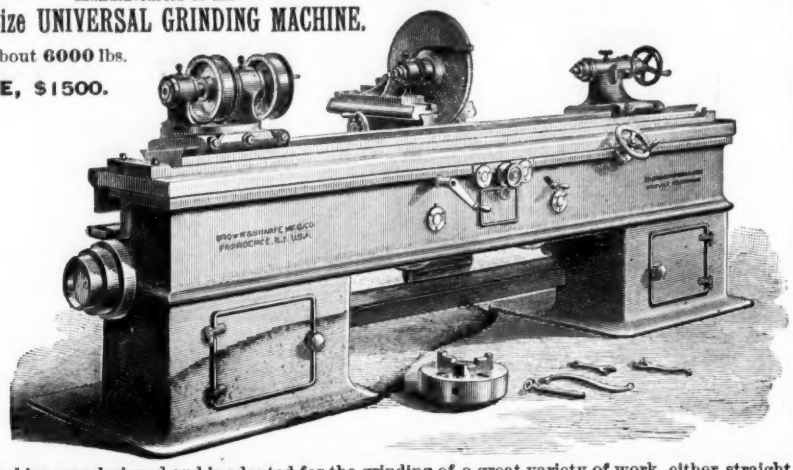
BROWN & SHARPE MFG. CO., PROVIDENCE, R. I.

Manufacturers of the

Large Size UNIVERSAL GRINDING MACHINE.

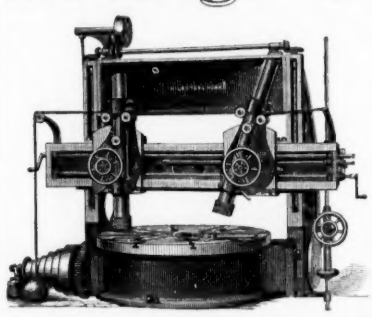
Weight about **6000** lbs.

PRICE, $1500.



This Machine was designed and is adapted for the grinding of a great variety of work, either straight or taper, having a capacity to take work upon centers 14 inches diameter and 6 feet in length. The emery wheel, which is 18 inches diameter by 1 inch thick, is driven by two 1¾ inch belts. Overhead works accompany the Machine. Tight and loose pulleys 12 inch diameter, 4½ inch face. Speed of first counter 250 turns per minute. Boxed and delivered at railroad or steamboat in Providence.

Boring and Turning Mills,



5, 6, 7, 8, 10, 12, 14 and 16 FT. SWING.

NEW MACHINE,

14×20 ft. Boring and Turning Mill. Housings and upper works arranged to slide back to take in work 20 ft. diameter. Has independent boring and key seating attachment.

NILES TOOL WORKS

Hamilton, Ohio.

PHILADELPHIA, 713 CHESTNUT STREET. | CHICAGO, 153 LAKE STREET.

WESTON'S PATENT

JIB CRANES

OF ANY CAPACITY. FOR HAND OR POWER.

Particulars on application, and full specification and tender promptly submitted on receipt of capacity, height of mast, length of radius, and whether to be operated by hand or power.

SOLE MAKERS:

THE YALE & TOWNE M'F'G CO.,

STAMFORD, CONN.

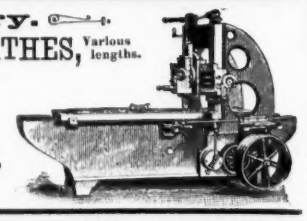
NEW YORK, 62 Reade Street. | PHILADELPHIA, 15 N. Sixth Street.
BOSTON, 224 Franklin Street. | CHICAGO, 64 Lake Street.

GENERAL CRANE CATALOGUES ON APPLICATION.

For Immediate Delivery.

30 in. x 30 in. PLANERS, to plane 6 ft. and 9 ft. long, also 19 in. LATHES, Various lengths.

GREAT REDUCTION IN PRICES.



G. A. GRAY, Jr. & CO.,

42 EAST EIGHTH STREET,

Cincinnati, O.

E. GOULD & EBERHARDT,

NEWARK, N. J.

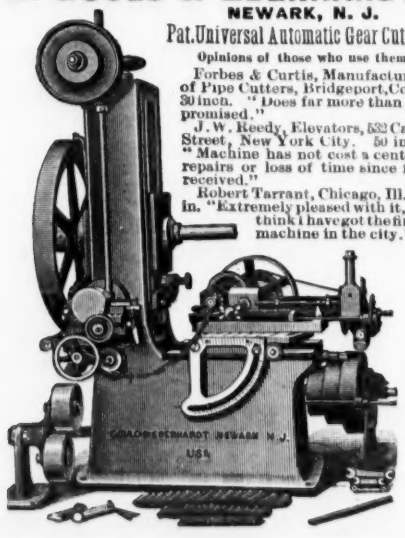
Pat. Universal Automatic Gear Cutter.

Opinions of those who use them.

Forbes & Curtis, Manufacturers of Pipe Cutters, Bridgeport, Conn. 30 inch. "Does far more than you promised."

J. W. Reedy, Elevators, 532 Canal Street, New York City. 50 inch. "Machine has not cost a cent for repairs or loss of time since first received."

Robert Tarrant, Chicago, Ill. 50 in. "Extremely pleased with it, and think i have got the finest machine in the city."



MILLING MACHINES

In seventeen regular and nine special varieties and sizes.

DRILL PRESSES,

Ten regular and eleven special sizes.

SENSITIVE DRILL PRESSES,

Two, three, four or more spindles.

TAPPING MACHINES,

Four Varieties.

HAND LATHES,

Eight, ten, twelve and fifteen inch swing, with or without back gears.

CUTTER GRINDERS,

WOOD PLANERS, SLIDE RESTS

AND

SPECIAL MACHINERY

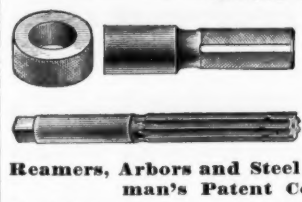
Of Every Description.

If in want of anything in the machinery line write for catalogue, stating what you want, to

E. E. GARVIN & CO., 139 to 143 CENTRE ST., NEW YORK.

THE PRATT & WHITNEY CO.

Hartford, Connecticut.



Manufacture Standard Size

Cylindrical and Caliper Gauges,

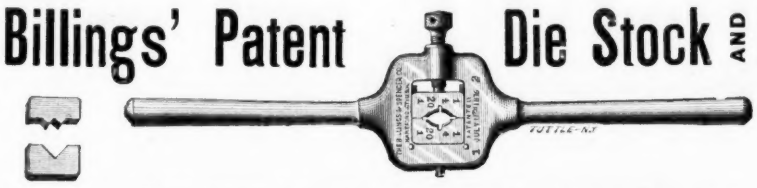
And End Measure Test Pieces. Straight and Taper Solid Hand Reamers, Chucking and Shell Reamers, Arbors and Steel Mandrels, Corundum Wheels, Cushman's Patent Combination Lathe Chuck.

PRICE LIST and DISCOUNT SHEET furnished on application.

THE BILLINGS & SPENCER CO., HARTFORD, CT., U. S. A.

MANUFACTURERS OF

Billings' Patent Die Stock and Dies.



Five Sizes—Cutting the full line of V Threads.

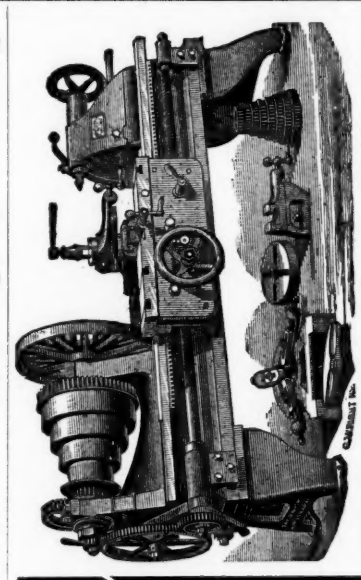
ALSO, U. S. STANDARD AND WHITWORTH DROP FORGED FROM BAR STEEL.

WARNER & SWASEY,

MACHINE TOOLS CLEVELAND, OHIO.

For IRON and BRASS WORK.

Illustrated Catalogue on application.



Engine Lathes, Planers, Drills, &c.

POND MACHINE TOOL CO., SUCCESSORS TO DAVID W. POND,

New Designs, Quick Delivery. Great Variety. Worcester, Mass.

GEO. W. FIFIELD,

MANUFACTURER OF

ENGINE LATHES

FROM 16 to 48 IN. SWING.

Cuts, Photographs and Prices furnished on application.

Lowell, Mass., U. S. A.

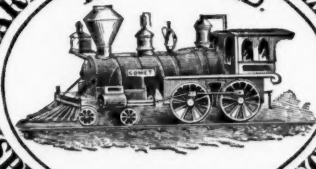
GEAR WHEELS and GEAR CUTTING.

Gears cut or made to order. Of every kind, spur, bevel, worm, rack, ratchet, internal, etc. Of any size, from a quarter-inch to six feet diameter. In any material. In any quantity. Small gears on hand for free delivery by mail. Send for illustrated price list.

GEO. B. GRANT, 66 Beverly St., Boston.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.

HARTFORD, CONN.



J. M. ALLEN, President.

W. B. FRANKLIN, Vice-President.

J. B. Pierce, Secretary.

KEY SEATING MACHINES

AND

20 in. Drills a specialty.

Our 20 in. Drill is a heavy substantial tool, made for service, has steel shafts and spindle. Gears and racks cut from the solid and have all modern improvements, are made by special machinery, and sold very low.

Our Key Seating Machine will save enough in 60 days' use to pay first cost; no shop can afford to do without one. We have now ready for prompt shipment, both Key Seat Machines and 20 in. Drills. Send for Photo. and Catalogue.

W. P. DAVIS, North Bloomfield, N. Y.

PUNCHING PRESSES,

ROP HAMMERS

Dies and other Tools for the manufacture of all kinds of SHEET METAL GOODS, Drop Forgings, &c.

Stiles & Parker Press Co., Middletown, Conn.

BRANCH FACTORY AND OFFICE, 59 DUANE STREET, N. Y.

THE BUFFALO STEEL FOUNDRY, BUFFALO, N. Y.

ORDERS AND CORRESPONDENCE SOLICITED. | PRATT & LETCHWORTH, Proprietors.

LODGE, BARKER & CO.,

Cincinnati, Ohio.

Monitor Turret Lathes with Chasing Bar. These lathes chase right and left hand threads without changing leaders, thus saving expenses. The center of holes in turret is high enough from top of plate to enable dies or box tools of 5 inches diameter clear around. Have side and end motion lever and screw, also swivel. Are first-class in every particular.

Manufacturers of IRON and BRASS

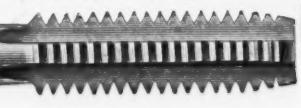
WORKING MACHINERY

Round and Square Arbor Lathes of 12 in. and 14 in. swing with side motion and chasing bar and without back gear for ELECTRICAL and other light work at reasonable figures.

Write us for Prices, it will pay you.

Box Chucks, Valve Millers, Speed Lathes, &c., &c.

J. M. CARPENTER PAWTUCKET, R. I.



MANUFACTURER —OF— TAPS AND DIES